

PRELIMINARY

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DOI-CO-150-2009-0005 EA

**Bull Mountain Unit Master Development Plan  
Preliminary Environmental Assessment**

**Gunnison County, Colorado  
March 22, 2012**

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**BLM**





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**U.S. Department of the Interior  
Bureau of Land Management  
Uncompahgre Field Office**

**ENVIRONMENTAL ASSESSMENT**

NUMBER: DOI-BLM-CO-150-2009-0005 EA

CASEFILE/PROJECT NUMBER: COC-67120X

PROJECT NAME: Bull Mountain Unit Master Development Plan (MDP)

LEGAL DESCRIPTION: The unitized area encompasses a combination of federal and private subsurface mineral estate totaling 19,645.10 acres. Over 90% of the subsurface minerals, both federal and fee within the geographic area of the Bull Mountain Unit, are committed to the Unit at this time. Table 1 provides a list of currently leased federal oil and gas subsurface minerals within the Unit and their locations. Current federal leases total 13,294.39 acres.

**Table 1. Federal Oil and Gas Subsurface Mineral Estate within the Bull Mountain Unit**

<b>Acres</b>	<b>Federal Lease Number</b>	<b>Township and Range</b>	<b>Section</b>	<b>Aliquots</b>
274.25	COC-42314	T11S R90W	14	Lot 3, SWNE, NWNW, SE
301.64	COC-63486	T11S R90W	11 13	Lots 3, 4, 8, 9, 10 Lots 5, 12, 13, 14, S2SW
1,284.63	COC-64164	T11S R89W	7 8 17 18	Lots 1, 2, E2NW N2, E2SW, SE NE, E2NW, N2SW, SESW, SE NESE
948.72	COC-64165	T11S R89W	19 20	Lots 3-11, SESW, SWSE ALL
1,232.59	COC-64166	T11S R89W	30 31	Lots 1-4, 7, W2NE, E2W2, SE Lots 1-4, E2, E2W2
433.31	COC-64167	T11S R89W	29	Lots 1-5, E2
1,343.80	COC-64170	T11S R90W	22 23 24	Lots 1-3, NWSE Lots 1-7, N2N2, S2NE, SENW, N2SE, SESE Lots 1-4, W2E2, W2
1,716.03	COC-64171	T11S R90W	27 34 35 36	Lots 1-2, W2NE E2 ALL Lots 1-4, W2E2, W2
976.39	COC-64172	T11S R90W	25 26	Lots 1-4, W2E2, W2 Lots 1-5, SENE, SE
2,100.71	COC-66704	T11S R89W	4 5 6 7	Lots 1-4, S2N2, S2 Lot 4, SWNW, W2SW, SESW, S2SE Lots 1-7, S2NE, SENW, E2SW, SE Lots 1-4, E2, E2W2
1,040.00	COC-66705	T12S R89W	8 9	N2, SW, N2SE, SWSE N2, NWSW, E2SE
40.00	COC-66714	T11S R90W	11	SWSW

**Table 1. Federal Oil and Gas Subsurface Mineral Estate within the Bull Mountain Unit**

Acres	Federal Lease Number	Township and Range	Section	Aliquots
1,582.97	COC-66715	T12S R90W	1 2 11 12	Lots 3-4, S2NW, SW Lots 1-9, SWNE, SENW, NESW, W2SE Lot 2, SENE, SWNW, SE ALL
19.40	COC-67145	T11S R89W	19 30	Lot 12 Lot 5-6

In addition to the federal oil and gas subsurface mineral estate, the Bull Mountain Unit includes the following 6,350.57 acres of private (fee) oil and gas subsurface mineral estate.

**Table 2. Private Oil and Gas Subsurface Mineral Estate within the Bull Mountain Unit**

Acres	Mineral Estate Owner	Township and Range	Section	P.M.
57.45	CDOT, State of Colorado: Highway 133 Corridor	T11S R89W T12S R89W	29, 32 5	6th 6th
6,293.12	Private (fee) land located in:	T11S R89W	7-8 17-20 29-32	6th
	Fee land located in:	T11S R90W	11-14 22: SE 23-26 27: E/2 34: E/2 35-36	6th
	Fee land located in:	T12S R89W	4-9	6th
	Fee land located in:	T12S R90W	1-2 11: NW, E/2 12	6th

**APPLICANT:** SG Interests I, Ltd. (SG)

**PURPOSE OF AND NEED FOR THE ACTION:**

The purpose of this proposal is to develop federal natural gas resources within the Bull Mountain Unit COC-67120X on federal leases consistent with existing federal lease rights. Exploration and development of federal oil and gas leases by private industry are integral to the BLM's oil and gas leasing program. The need for the action is to increase the orderly development of natural gas resources consistent with the Energy Policy Acts of 2001 and 2005 which emphasize the development of domestic natural gas reserves for supply and economic stability.

**BACKGROUND/INTRODUCTION:**

SG is proposing a Master Development Plan (MDP) for natural gas exploration and development of up to 146 natural gas wells (approximately 50% shale gas and 50% coalbed methane natural gas, or CBNG), 4 water disposal wells, and associated infrastructure on federal and private mineral leases within a federally unitized area known as the Bull Mountain Unit. Instead of structuring the development of the federal leases as a series of individual actions, the Bureau of Land Management (BLM) encourages the use of multi-well development plans to more effectively manage federal lease development (BLM IM 2005-247). Additionally, federal unitization allows for placement of wells within the Unit in a logical fashion



without regard to setbacks from committed lease lines in order to minimize road development, pipelines, and other surface impacts [Onshore Order 1 (Chapter 3, APDs, 3H-MDPs)].

The decision by SG to develop the area arises from the implementation of drilling that successfully demonstrated the potential for economically viable reserves of natural gas within the vicinity of the geographic feature known as Bull Mountain. At present, SG is required to diligently develop at least two producing wells per year in order to maintain the Bull Mountain Unit designation.

In 2003 (updated in 2008) the BLM unitized the minerals within the Bull Mountain area to provide guidance for orderly, planned, and structured development for extraction of the mineral (oil and natural gas) resources. The Bull Mountain Unit encompasses only those lands considered necessary for the proper development of the unitized resources (BLM Handbook H-3180-1). “The objective of unitization is to proceed with a program that will adequately and timely explore and develop all committed lands within the unit area without regard to internal ownership boundaries . . . By effectively eliminating internal property boundaries within the unit area, unitization permits the most efficient and cost effective means of developing the underlying oil and gas resources.” (*Draft BLM Manual*, Section 3180-1 Unitization [Exploratory], p. 2-60).

An approved MDP would provide a guiding “umbrella” environmental analysis to which subsequent Applications for Permit to Drill (APDs) and NEPA efforts would be tiered. Every federal action proposed within the Bull Mountain Unit would require site NEPA compliance. Consistent with the Energy Policy Act of 2005, 30 U.S.C. 15942(b), most federal APDs submitted during the five years following the approval of this MDP would benefit from streamlined NEPA analysis based on the programmatic impact evaluation contained in this MDP. Approval would be subject to onsite examinations of each proposed well, pipeline, and road location including current resource surveys. BLM would apply appropriate mitigation and best management practices to all permitted actions in accordance with federal and state oil and gas regulations and the Uncompahgre Basin Resource Management Plan (UBRMP).

The total project area consists of 500 surface acres of federal surface underlain by federal mineral estate and administered by BLM; 12,795 acres of *split-estate* lands consisting of private surface and federal minerals also administered by BLM; 57 acres of surface owned by the State of Colorado with fee minerals; and 6,923 acres of “*fee*” land consisting of private surface and private minerals regulated by the Colorado Oil and Gas Conservation Commission (COGCC) (Figure 2). The boundaries of the Unit encompass federal and private oil and gas mineral estate which covers approximately 19,645 acres located in Gunnison County, Colorado.

Regarding split-estate lands, a Memorandum of Understanding (MOU) is also in effect between BLM Colorado State Office, the U.S. Forest Service (USFS) Rocky Mountain Region, and the COGCC regarding the application of COGCC’s final amended rules for oil and gas operations which became applicable on federal lands July 1, 2009. The MOU facilitates cooperative efforts among these agencies in order to limit potential for redundancy or conflicting regulations among the permitting authorities to the operator, yet recognizes that each regulatory agency in Colorado must receive permits from oil and gas operators which comply with and include responses to their own specific rules and regulatory requirements.

The MOU further instructs operators and regulatory agencies to identify and incorporate applicable standards and practices contained in the COGCC rules into federal APD, MDP, or other authorizations related to oil and gas operations so long as such state standards or practices are at least as stringent as comparable federal standards or practices, in order to minimize the potential for multiple reviews.

### Regional Setting

The Bull Mountain Unit is located approximately 30 miles northeast of the Town of Paonia, and is bisected by State Highway (SH) 133. The elevation is approximately 7,400 feet, consisting of rolling topography in a mountainous region (Figure 1). Snow blankets most of the area from mid-October through mid-May, increasing from an average of a few inches through early December to an average high

of 5.5 to 6 feet in March (NRCS SNOTEL data, Booth station, Gunnison County, 2010-2011 Water Years). However, south-facing slopes have more winter melting events and north-facing slopes retain snow longer and accumulate more snow through the course of the winter. East and West Muddy Creek, the two main drainages that collect local surface waters within the Unit, reach their confluence just south and outside of the Unit, where they form Muddy Creek. The Unit is within the Colorado River basin.

Expansive irrigated hay meadows are generally found in the bottomlands of the East Muddy Creek basin. Irrigated meadows are also found in the Ault Creek basin at the far western side of the Unit. There are many irrigation diversions off of the larger creeks, especially on the eastern side of the Unit. Stock ponds for domestic cattle and sheep grazing occur frequently on the landscape, and in general retain surface waters throughout the year.

The Unit is dominated by sagebrush (*Artemisia tridentata* subsp. *vaseyana*). Oakbrush communities comprised of Gambel's oak (*Quercus gambelii*), Saskatoon and Utah serviceberry (*Amelanchier utahensis* and *A. alnifolia*), and chokecherry (*Padus virginiana*) are the second most common, followed by mixed mountain shrubland. Other vegetation communities include aspen (*Populus tremuloides*) woodlands and irrigated pasturelands.

Cattle grazing occurs over most of the area during the snow-free months, typically mid-May through mid-October. Some springtime and fall sheep grazing occurs as well. In the fall, portions of the Unit are used for gathering cattle and sheep coming off of grazing allotments on the adjacent Grand Mesa, Uncompahgre, and Gunnison (GMUG) National Forest. A few residential subdivisions are located within the Unit, generally near the SH 133 corridor.

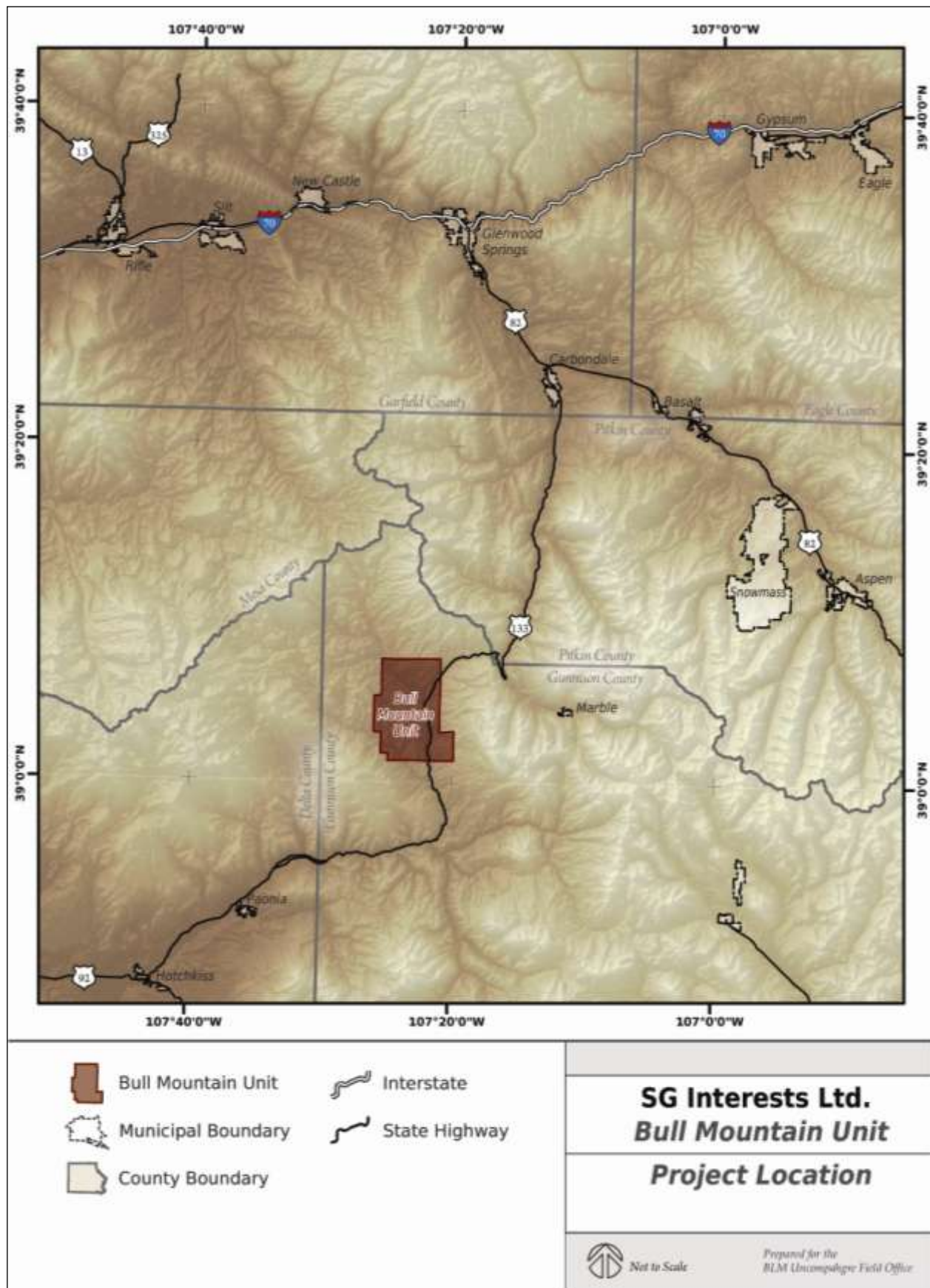


Figure 1. Project Area Location

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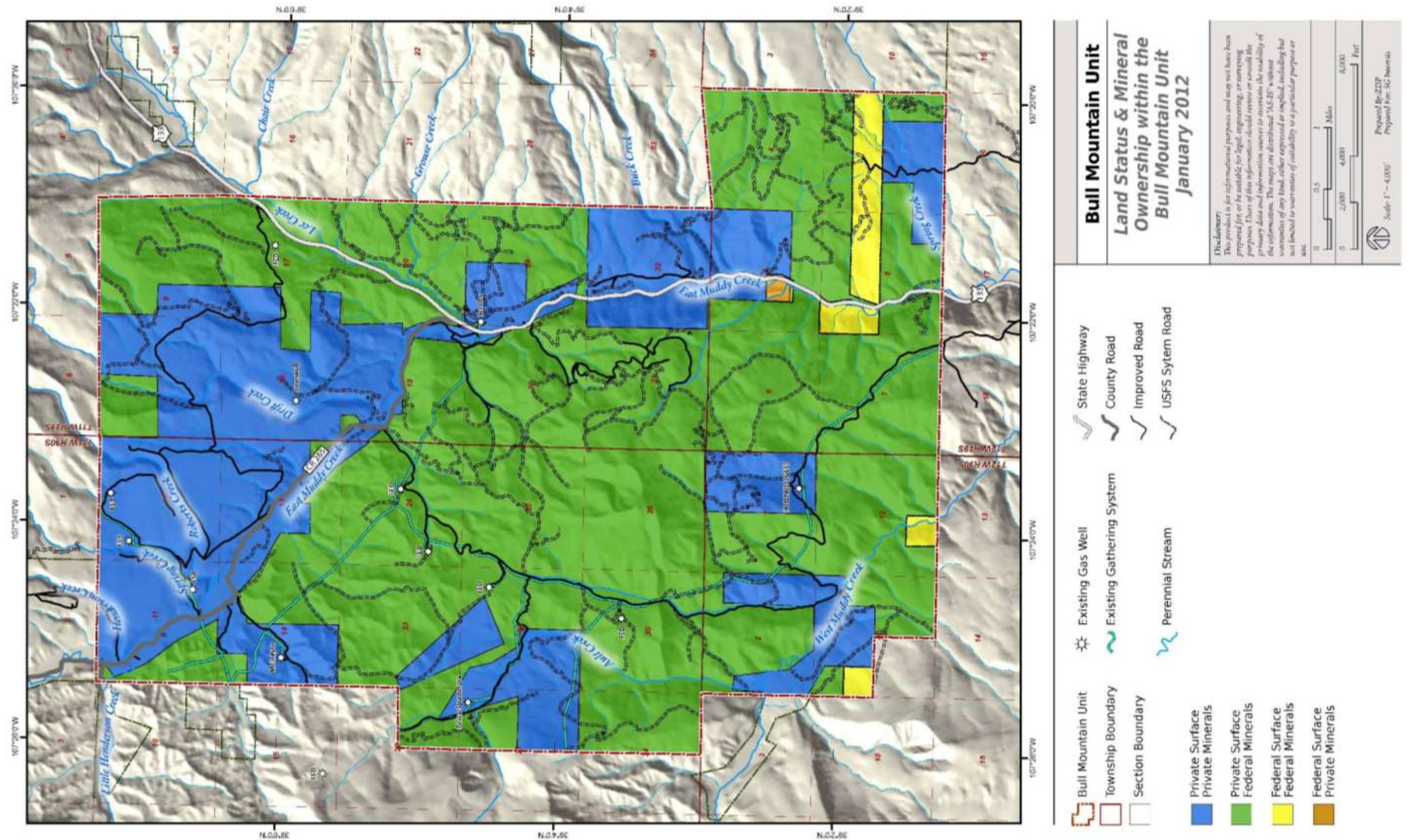


Figure 2. Surface and Subsurface Ownership within the Bull Mountain Unit



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### Existing Natural Gas Development and Activities within the Unit

SG began leasing minerals in the Bull Mountain Unit in 2000 and has periodically purchased additional mineral interests within the Unit. The company currently owns and operates 11 fee/fee and 5 federal natural gas wells on 13 well pads and one water-disposal well (Table 3, Figure 3) occupying approximately 21.8 acres in the Unit. The wells were developed at an average of 2 per year for the past 6 years. To date, SG and Gunnison Energy Corporation (the other existing operator in the Bull Mountain Unit) have developed 16.8 miles of gathering pipelines (4.5 miles co-located with roads, and 12.3 miles cross-country) and improved approximately 13.7 miles of roads within the Unit for pad site access (not including Gunnison County Road 265, which has also been improved by Gunnison County Road and Bridge and by the operators according to various road use agreements). Natural gas is currently delivered to the Bull Mountain Pipeline and the Ragged Mountain Pipeline north of the Unit for delivery to local and national markets.

**Table 3. SG's Existing Wells and Well Pads, Bull Mountain Unit**

<b>Well Name and Number</b>	<b>Lease No.</b>	<b>Surface Ownership</b>	<b>Mineral Rights Ownership</b>	<b>Township, Range, Section</b>	<b>Quarter</b>	<b>Year Drilled/ Status</b>
Falcon Seaboard 11-90-12 #1 <sup>1</sup>	n/a	Fee	Fee	T11S R90W S11	SWNW	2002 Producing
Falcon Seaboard 11-90-12 #1a <sup>1</sup>	n/a	Fee	Fee	T11S R90W S11	NWNW	2006 Shut-in
Falcon Seaboard 11-90-11 #2	n/a	Fee	Fee	T11S R90W S12	SESE	2006 Shut-in
Falcon Seaboard 11-90-12 #2	n/a	Fee	Fee	T11S R90W S12	NWNE	2006 Producing
McIntyre 11-90-14 #1	n/a	Fee	Fee	T11S R90W S14	NWSE	2006 Shut-in
Jacobs 29-1	n/a	Fee	Fee	T11S R89W S29	NWNW	1991 Shut-in
Federal 11-89-17 #1	COC64164	Fee	Federal	T11S R87W S17	SWNE	2009 Shut-in
Federal 11-90-24 #1 <sup>2</sup>	COC64170	Fee	Federal	T11S R90W S24	SWNE	2011 Shut-in
Federal 11-90-24 #1a <sup>2</sup>	COC64170	Fee	Federal	T11S R90W S24	SWNE	2007 Shut-in
Federal 11-90-26 #1	COC64172	Fee	Federal	T11S R90W S26	NENE	2007 Shut-in
Federal 11-90-35 #1	COC64171	Fee	Federal	T11S R90W S35	SWNE	2009 Shut-in
Cow Skull 11-89-18 #1 <sup>3</sup>	n/a	Fee	Fee	T11S R989W S18	NESW	2011 Shut-in
Cow Skull 11-89-18 #2 <sup>3</sup>	n/a	Fee	Fee	T11S R989W S18	NESW	2011 In dev. <sup>4</sup>
HL 11-89-19 #1	n/a	Fee	Fee	T11S R89W S19	SENE	2011 In dev. <sup>5</sup>
Pasco Spadafora #2	n/a	Fee	Fee	T11S R90W S27	NENE	2010 Shut-in
Pasco Spadafora #3	n/a	Fee	Fee	T11S R90W S27	NENE	2011 In dev. <sup>4</sup>

**Table 3. SG's Existing Wells and Well Pads, Bull Mountain Unit**

<b>Well Name and Number</b>	<b>Lease No.</b>	<b>Surface Ownership</b>	<b>Mineral Rights Ownership</b>	<b>Township, Range, Section</b>	<b>Quarter</b>	<b>Year Drilled/ Status</b>
Federal 24-2 WDW (water disposal well) <sup>6</sup>	COC64170 State Permit #20081193	Fee	Federal	T11S R90W S24	NWSW	2010 Operational

<sup>1, 2, 3</sup> Co-located on a single well pad.

<sup>4</sup> In development; permitted and drilled in 2011.

<sup>5</sup> In development; permitted in 2011.

<sup>6</sup> This well was drilled into federal minerals, but the conversion to a water disposal well gives management of the well bore to the State to monitor.



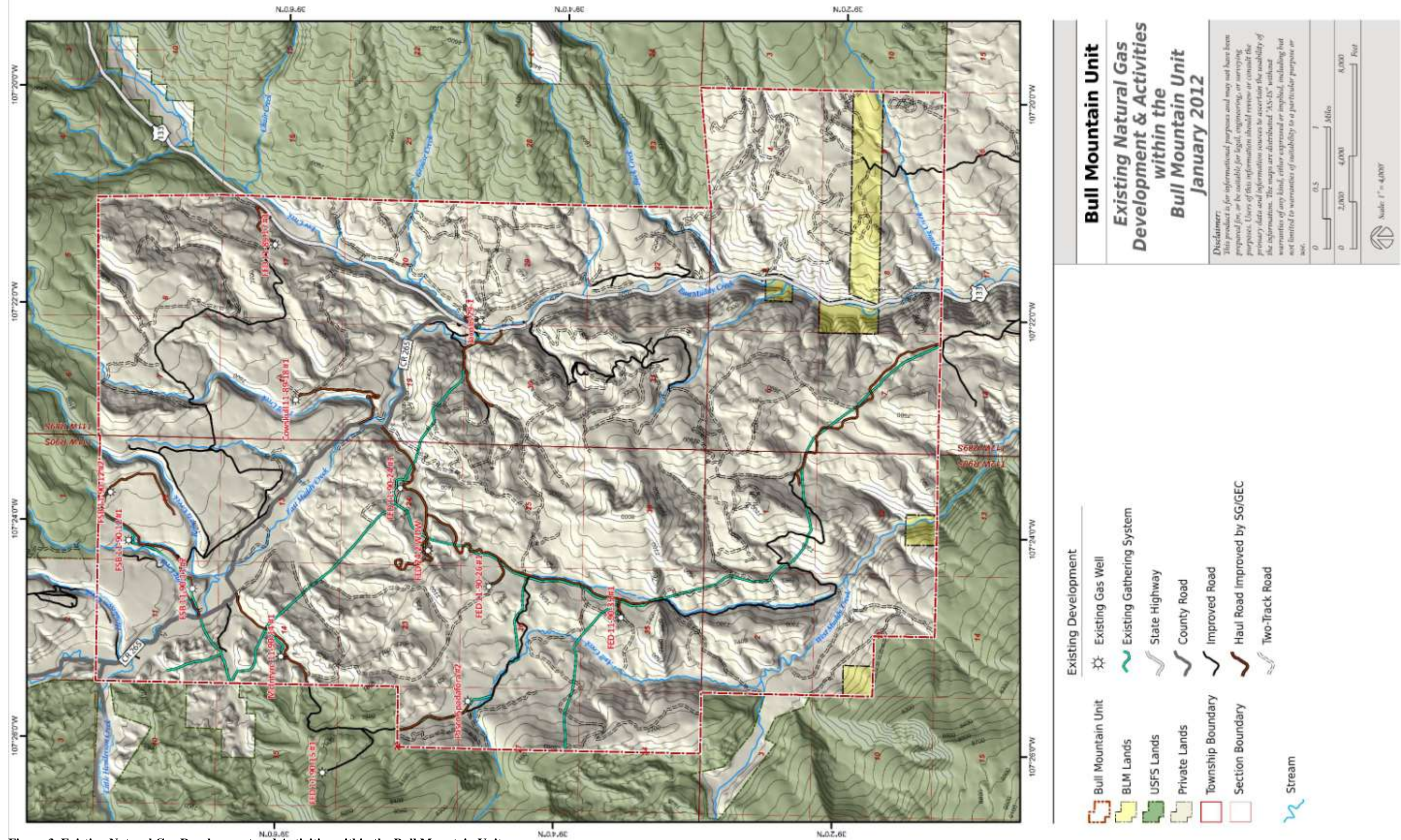


Figure 3. Existing Natural Gas Development and Activities within the Bull Mountain Unit



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## DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES:

Three alternatives are analyzed in this EA:

- Proposed Action: SG's proposed Master Development Plan
- Alternative 1: an alternative developed in response to comments received during scoping that minimizes surface disturbance while allowing the operator the same number of well pads contained in the Proposed Action.
- No Action: the "No Action" alternative provides a point of reference for evaluating the environmental effects of the action alternatives. It includes existing development on federal and fee mineral estate and proposed new development on fee mineral estate. It does not include further development of federal wells.

For the Bull Mountain Unit, Geographic Information Systems (GIS) technology was employed to identify well pad sites that adhere to specific environmental, regulatory, and cost constraints and still enable efficient development of the Unit to extract natural gas. The model was used to generate the specifics of both action alternatives, using different weights for specific criteria to address issues raised during public and agency scoping. Based on the results of the model, suitable well pad locations were identified. The quantity selected was achieved by compiling statistics and reviewing the suitable locations identified. The statistics gathered for each well pad allowed all locations to be quickly ranked and evaluated by model suitability, impacts to hydrology zones, and overall length of roads and pipelines to generate Alternative 1. Additional detail and discussion of the GIS modeling process is included as Appendix A to this document.

The main difference between the Proposed Action and Alternative 1 is the location of the proposed well pads based on the site-selection process (the GIS model), which results in varying amounts of associated infrastructure such as roads and pipelines.

### **PROPOSED ACTION**

SG proposes to drill up to 146 natural gas wells and 4 water disposal wells on 36 new well pads and 5 existing well pads on private surface overlying federal mineral estate within the Bull Mountain Unit. Approximately 50% (73) of the proposed natural gas wells would be CBNG, and 50% (73) would be shale gas. Four of the new well pads would be for water disposal wells to reinject produced and flowback water into the target formations. The existing well pad that currently contains a water disposal well would also be used for drilling additional new CBNG and/or shale gas wells. Due to the exploratory nature of the proposed project, the quantity and combination of CBNG and shale gas wells on each pad is not known at this time; however, no more than one water disposal well would be drilled on a well pad.

Additional activities under the Proposed Action include:

- upgrades and/or new construction and operation of an access road to each well pad;
- installation of pipelines to transport natural gas from each well to existing pipeline infrastructure, including the Bull Mountain Pipeline, and subsequent delivery to local and national markets;
- installation of water pipelines co-located with natural gas pipelines to take produced water from well pads to water disposal wells;
- installation of overhead electrical lines to the water disposal wells; and
- installation of 2 screw compressor stations on already cleared private property.

Well pads and supporting infrastructure for the Proposed Action are summarized in Table 4a. The Proposed Action includes all elements of Appendix B, which has specific information about the construction, drilling, and completion of wells, construction of supporting infrastructure, and requirements for interim and final reclamation.

**Table 4a. Main Elements of the Proposed Action**

Element	Amount	Acres of Surface Disturbance	
		Construction Phase	Production Phase
Well pad sites <sup>1</sup>	<b>41 total</b>	<b>126.9</b>	<b>56.0</b>
Natural gas well pads (4 existing, 32 new)	36	112.8	49.3
Water disposal well pads (1 existing, 4 new)	5	14.1	6.7
Wells	<b>150</b>		
Natural gas wells	146		
Water disposal wells	4		
Access roads	<b>36.4 mi. total</b>	<b>97.5</b>	<b>69.9</b>
Existing improved roads <sup>2</sup>	10.7 mi.	20.2	20.2
Upgrades to existing two-track roads	13.5 mi.	41.0	26.3
Construction of new roads <sup>3</sup>	12.2 mi.	36.3	23.4
Pipelines <sup>4</sup>	<b>22.1 mi. total</b>	<b>82.7</b>	<b>0.0<sup>5</sup></b>
Co-located with roads	11.4 mi.	20.4	0.0
Not co-located with roads	10.7 mi	62.3	0.0
Overhead electrical lines to water disposal wells <sup>6</sup>	<b>14 power poles</b>	<b>0.008</b>	<b>0.008</b>
<b>Total surface disturbance</b>		<b>307.1</b>	<b>125.9</b>
<b>Total new surface disturbance (excludes existing roads)</b>		<b>286.9</b>	<b>105.7</b>

<sup>1</sup> Initial construction disturbance for all new well pads would include reserve pit backfill, cut-and-fill slopes, and buffer area.

<sup>2</sup> Existing roads represent unreclaimed surface disturbance used in connection with this action.

<sup>3</sup> 16-foot-wide drivable road surface; 25-foot-wide construction disturbance. For access roads, this includes all surface disturbance resulting from the construction of the proposed road, excluding the roadbed itself (heavy equipment operation and cut/fill areas along road shoulders of road that would be reclaimed following construction).

<sup>4</sup> Acreage based on an average 50-foot-wide pipeline construction corridor.

<sup>5</sup> After the pipeline is constructed and buried, the disturbed area would be reclaimed in its entirety.

<sup>6</sup> Based on the Delta Montrose Electrical Assn. estimate of 14 power poles for the Proposed Action, at eight (8) square feet of construction surface disturbance per pole. Pole installation would be done using existing two-track roads, and no additional clearing of vegetation would be required.

New well pads would average 200'x300' (1.38 acres) in size after interim reclamation (production phase), and would accommodate up to 5 wells each. An average of 3.5 acres would initially be disturbed for construction of each new well pad. Construction of well pads, access roads, pipelines, and electrical lines would disturb a total of 286.9 acres within the Unit. The construction and drilling phase is estimated to last approximately 6 years, as described below.

Drilling and completion of the new wells is proposed to begin in the summer of 2012. The proposed CBNG wells would be drilled conventionally, using a single vertical well-bore. Development of CBNG wells on new well pads, including construction, drilling, stimulation, and completion, would require an average of 60 days. The proposed shale gas wells could be drilled either conventionally or with multiple horizontal well-bores from a single pad where feasible to minimize the number of well pads required to drain the resource. Development of shale gas wells on new well pads would require an average of 85 days, and water disposal wells would require 60 to 120 days.

Although actual operations are subject to change as conditions warrant, for purposes of this analysis SG plans to utilize 3 Tier-2 drilling rigs per season, simultaneously drilling 3 wells for 3 successive sessions, for a total of 27 wells drilled per year until the resource is fully developed. At this rate, full-field development would be complete in just over 5.5 years (effectively 6 construction/drilling seasons). Factors including geologic characteristics, reservoir quality, engineering technology, and economic conditions could result in a different ratio of CBNG to shale gas wells being drilled, and in fewer than 150 total wells being drilled within the Unit. Once completed, the productive life of CBNG, shale gas, and water disposal wells is estimated to be 40 years, which is the production phase of the project.

SG estimates that between 500 and 3,000 barrels per day (bbls) of produced water from the CBNG wells would be injected into each of the water disposal wells at full build-out of the Unit. In the interim, produced water would be reinjected into the existing water disposal well within the Unit or trucked to an approved disposal site.

Formations targeted for testing/development include the following (in **underlined bold**):

**CRETACEOUS**

- Mesaverde Group
  - Williams Fork Formation
    - Sandstones**
    - Coals (Cameo, South Canyon, and Coal Ridge)**
  - Iles Formation
    - Sandstones (Cozzette, Corcoran)**
- **Mancos Shale Group**

Facilities would be located on private surface overlying federal mineral estate. As proposed, all 32 of the proposed new gas well pads would target federal mineral estate, and all 4 proposed water disposal wells would target appropriate disposal zones within federally administered mineral formations. General well pad locations are identified in Table 4b and on Figure 4.

**Table 4b. Existing and Proposed Well Locations, Proposed Action<sup>1</sup>**

	<b>Pad No.</b>	<b>Lease No.</b>	<b>Township, Range, Section</b>	<b>Quarter<sup>2</sup></b>
<b>EXISTING</b>				
1	FED 11-89-17 #1	COC64164	T11S R87W S17	SWNE
2	FED 11-90-24 #1 <sup>3</sup>	COC64170	T11S R90W S24	SWNE
	FED 11-90-24 #1a <sup>3</sup>		T11S R90W S24	SWNE
3	FED 11-90-26 #1	COC64172	T11S R90W S26	NENE
4	FED 11-90-35 #1	COC64171	T11S R90W S35	SWNE
5	FED 24-2 WDW <sup>4</sup>	COC64170	T11S R90W S24	NWSW
<b>PROPOSED</b>				
1	FED 11-89-17 #3	COC64164	T11S, R89W, S17	SESW
2	FED 11-89-20 #1	COC64165	T11S, R89W, S20	NWSE
3	FED 11-89-20 #2		T11S, R89W, S20	NWNW
4	FED 11-89-20 #3		T11S, R89W, S20	SENE
5	FED 11-89-29 #2	COC64167	T11S, R89W, S29	SESE
6	FED 11-89-29 #3		T11S, R89W, S29	SWNE
7	FED 11-89-30 #1	COC64166	T11S, R89W, S30	SESE
8	FED 11-89-31 #1		T11S, R89W, S31	NWNW
9	FED 11-89-31 #2		T11S, R89W, S31	SENE
10	FED 11-89-8 #1	COC64164	T11S, R89W, S8	SENE
11	FED 11-89-8 #2		T11S, R89W, S8	SESE
12	FED 11-89-8 #3		T11S, R89W, S8	SWNW
13	FED 11-90-11 #1	COC63486	T11S, R90W, S11	NWSW
14	FED 11-90-14 #3	COC42314	T11S, R90W, S14	NESE
15	FED 11-90-23 #2	COC64170	T11S, R90W, S23	SENE
16	FED 11-90-24 #3		T11S, R90W, S24	SESE

**Table 4b. Existing and Proposed Well Locations, Proposed Action<sup>1</sup>**

	<b>Pad No.</b>	<b>Lease No.</b>	<b>Township, Range, Section</b>	<b>Quarter<sup>2</sup></b>
17	FED 11-90-25 #1	COC64172	T11S, R90W, S25	SENE
18	FED 11-90-25 #3		T11S, R90W, S25	NESE
19	FED 11-90-27 #2	COC64171	T11S, R90W, S27	SWNE
20	FED 11-90-34 #1		T11S, R90W, S34	SWNE
21	FED 11-90-35 #2		T11S, R90W, S35	SESW
22	FED 11-90-36 #1		T11S, R90W, S36	NENW
23	FED 12-89-4 #1		T12S, R90W, S4	SESE
24	FED 12-89-6 #1	COC66704	T12S, R89W, S6	SESW
25	FED 12-89-6 #2		T12S, R89W, S6	NWNE
26	FED 12-89-6 #3		T12S, R89W, S6	SENE
27	FED 12-89-7 #1		T12S, R89W, S7	NESE
28	FED 12-89-9 #2	COC66705	T12S, R89W, S9	NENW
29	FED 12-90-12 #1	COC66715	T12S, R90W, S12	SESE
30	FED 12-90-12 #2		T12S, R90W, S12	SWNE
31	FED 12-90-2 #1		T12S, R90W, S2	SWSE
32	FED 12-90-2 #2		T12S, R90W, S2	NENE
33	FED 11-89-17 #2 WDW <sup>4</sup>	COC64164	T11S, R89W, S17	SENE
34	FED 11-90-14 #2 WDW <sup>4</sup>	COC42314	T11S, R90W, S14	NWNW
35	FED 11-90-25 #2 WDW <sup>4</sup>	COC64172	T11S, R90W, S25	NWNE
36	FED 12-89-7 #2 WDW <sup>4</sup>	COC66704	T12S, R89W, S7	SENE

<sup>1</sup> Analysis area for each well pad includes approximately 40 acres surrounding the proposed well head location. Legal location based on proposed location of well head.

<sup>2</sup> Well head location for proposed wells subject to on-site review following submittal of APD.

<sup>3</sup> Co-located on a single well pad.

<sup>4</sup> Water disposal well.

SG has committed to the use of Best Management Practices and mitigation measures as listed in Appendix C. Surface Use Conditions of Approval (COAs) would be attached to each APD to further minimize or mitigate site-specific environmental impacts. The COAs for wells would be specific to each site depending on agency permitting. Appendix D, 13-Point Surface Use Plan of Operations, provides an example of the plan that would be attached to each individual APD, including a typical well site and drilling plan and specific information regarding construction, operation, and reclamation on the specific site. The Surface Use Plan of Operations covers direct and indirect federal actions associated with this development project, including the Proposed Action, Alternative 1, and federal actions that are part of the No Action Alternative. Appendix H is SG's Noxious Weed Management Plan.



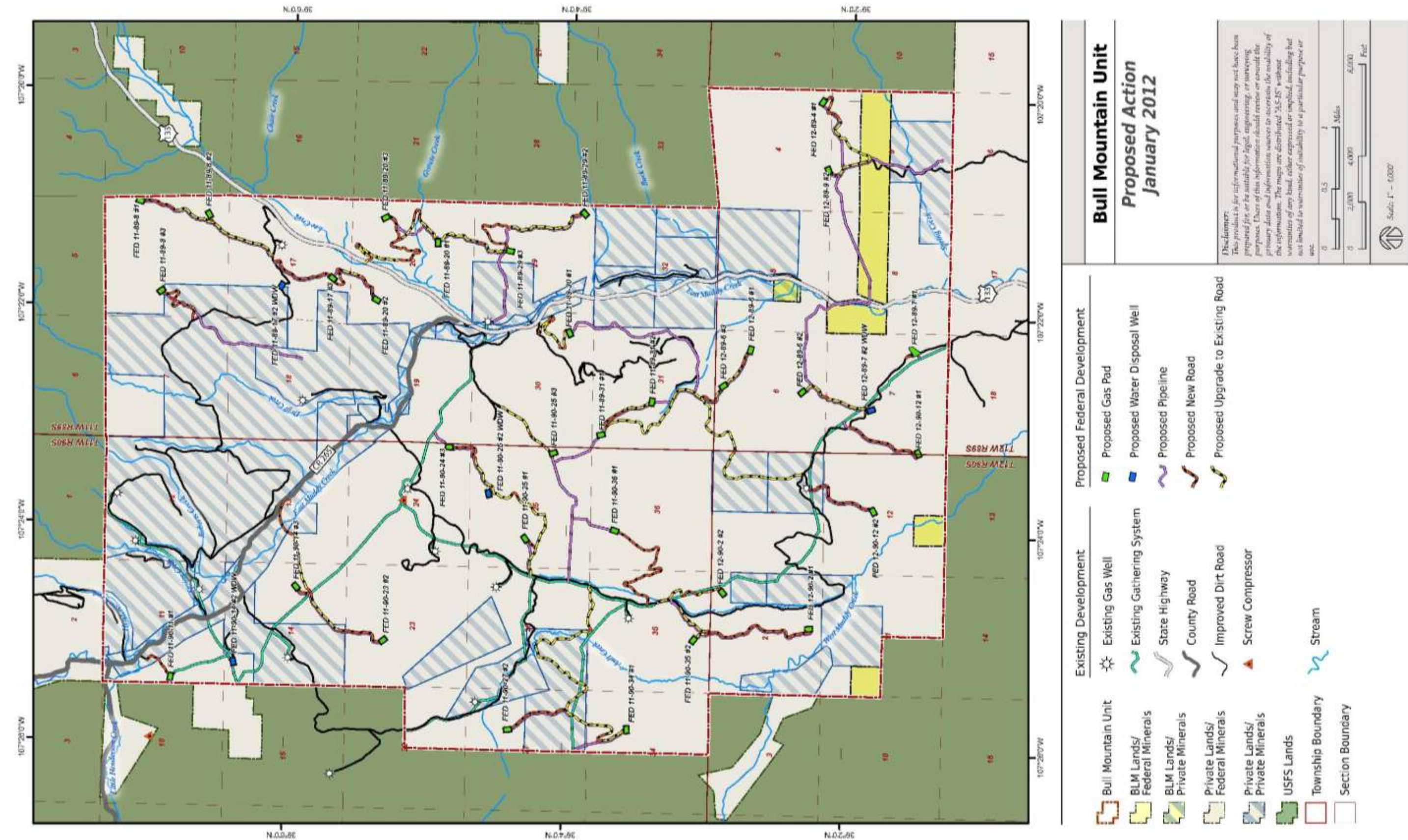


Figure 4. Proposed Action

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## ALTERNATIVE 1

Alternative 1 was developed by modifying the GIS model to minimize surface disturbance by putting greater emphasis on soil types and co-locating roads and pipelines whenever possible, which in turn would reduce the miles of road and pipeline needed to service the pad sites (Appendix A). The number of well pads, number and types of wells, and the types of supporting infrastructure would be the same as for the Proposed Action (Table 5a). One well pad would be located on BLM-administered surface, and the remainder would be located on private surface targeting federal mineral estate. Alternative 1 includes all elements shown in Appendix B and all mitigation shown in Appendix C.

**Table 5a. Main Elements of Alternative 1**

Element	Amount	Acres of Surface Disturbance	
		Construction Phase	Production Phase
Well pad sites <sup>1</sup>	<b>41 total</b>	<b>126.8</b>	<b>56.0</b>
Natural gas well pads (4 existing, 32 new)	36	112.7	49.3
Water disposal well pads (1 existing, 4 new)	5	14.1	6.7
Wells	<b>150</b>		
Natural gas wells	146		
Water disposal wells	4		
Access roads	<b>34.1 mi. total</b>	<b>89.4</b>	<b>65.4</b>
Existing improved roads <sup>2</sup>	11.7 mi.	21.9	21.9
Upgrades to existing two-track roads	11.4 mi.	34.9	22.4
Construction of new roads <sup>3</sup>	11.0 mi.	32.6	21.1
Pipelines <sup>4</sup>	<b>16.1 mi. total</b>	<b>61.5</b>	<b>0.0</b> <sup>5</sup>
Co-located with roads	7.6 mi.	13.7	0.0
Not co-located with roads	8.5 mi	47.8	0.0
Overhead electrical lines to water disposal wells <sup>6</sup>	<b>8 power poles</b>	<b>0.006</b>	<b>0.006</b>
<b>Total surface disturbance</b>		<b>277.7</b>	<b>121.4</b>
<b>Total new surface disturbance (excludes existing roads)</b>		<b>255.8</b>	<b>99.5</b>

<sup>1</sup> Initial construction disturbance for all well pads would include reserve pit backfill, cut-and-fill slopes, and buffer area.

<sup>2</sup> Existing roads represent unreclaimed surface disturbance used in connection with this action.

<sup>3</sup> 16-foot-wide drivable road surface; 25-foot-wide construction disturbance. For access roads, this includes all surface disturbance resulting from the construction of the proposed road, excluding the roadbed itself (heavy equipment operation and cut/fill areas along road shoulders of road that would be reclaimed following construction).

<sup>4</sup> Acreage based on an average 50-foot-wide pipeline construction corridor.

<sup>5</sup> After the pipeline is constructed and buried, the disturbed area would be reclaimed in its entirety.

<sup>6</sup> Based on the Delta Montrose Electrical Assn. estimate of 8 power poles for Alternative 1, at eight (8) square feet of construction surface disturbance per pole. Pole installation would be done using existing two-track roads, and no additional clearing of vegetation would be required.

Construction of well pads, access roads, pipelines, and electrical lines would disturb a total of 255.8 acres within the Unit. Proposed well pad locations are identified in Table 5b and on Figure 5.

**Table 5b. Existing and Proposed Well Locations, Alternative 1<sup>1</sup>**

	Pad No.	Lease No.	Township, Range, Section	Quarter <sup>2</sup>
<b>EXISTING</b>				
1	FED 11-89-17 #1	COC64164	T11S R87W S17	SWNE
2	FED 11-90-24 #1 <sup>3</sup>	COC64170	T11S R90W S24	SWNE
	FED 11-90-24 #1a <sup>3</sup>		T11S R90W S24	SWNE

**Table 5b. Existing and Proposed Well Locations, Alternative 1<sup>1</sup>**

	<b>Pad No.</b>	<b>Lease No.</b>	<b>Township, Range, Section</b>	<b>Quarter<sup>2</sup></b>
3	FED 11-90-26 #1	COC64172	T11S R90W S26	NENE
4	FED 11-90-35 #1	COC64171	T11S R90W S35	SWNE
5	FED 24-2 WDW <sup>4</sup>	COC64170	T11S R90W S24	NWSW
<b>PROPOSED</b>				
1	ALT 11-89-8 #1	COC64164	T11S, R89W, S8	SWNW
2	ALT 11-89-17 #2	COC64165	T11S, R89W, S17	SESE
3	ALT 11-89-19 #2		T11S, R89W, S19	NESW
4	ALT 11-89-20 #1		T11S, R89W, S20	SWSW
5	ALT 11-89-29 #2	COC64167	T11S, R89W, S29	NWNE
6	ALT 11-89-29 #3		T11S, R89W, S29	SWNE
7	ALT 11-89-29 #4	COC64166	T11S, R89W, S29	SESE
8	ALT 11-89-31 #1		T11S, R89W, S31	NWNW
9	ALT 11-89-31 #2		T11S, R89W, S31	SENW
10	ALT 11-89-31 #3	COC64164	T11S, R89W, S31	SESW
11	ALT 11-90-11 #1		T11S, R90W, S11	NWSW
12	ALT 11-90-14 #2		T11S, R90W, S14	NESE
13	ALT 11-90-24 #3	COC63486	T11S, R90W, S24	NENW
14	ALT 11-90-24 #4	COC42314	T11S, R90W, S24	SESE
15	ALT 11-90-25 #2	COC64170	T11S, R90W, S25	SENW
16	ALT 11-90-25 #3		T11S, R90W, S25	SWSW
17	ALT 11-90-26 #3	COC64172	T11S, R90W, S26	SWNE
18	ALT 11-90-26 #4		T11S, R90W, S26	SESE
19	ALT 11-90-34 #1	COC64171	T11S, R90W, S34	SWNE
20	ALT 11-90-35 #2		T11S, R90W, S35	SESW
21	ALT 12-89-4 #1		T11S, R89W, S4	NESW
22	ALT 12-89-4 #2	COC66704	T11S, R89W, S4	SESE
23	ALT 12-89-6 #1		T12S, R89W, S6	SWNW
24	ALT 12-89-6 #2		T12S, R89W, S6	NESW
25	ALT 12-89-6 #3		T12S, R89W, S6	SESW
26	ALT 12-89-7 #1		T12S, R89W, S7	NWNW
27	ALT 12-89-7 #3		T12S, R89W, S7	NESE
28	ALT 12-89-9 #2	COC66705	T12S, R89W, S9	NWNE
29	ALT 12-89-9 #3	COC66715	T12S, R89W, S9	SENW
30	ALT 12-90-1 #2		T12S, R90W, S1	NESW
31	ALT 12-90-1 #3		T12S, R90W, S1	SESW
32	ALT 12-90-2 #1		T12S, R90W, S2	NENE
33	ALT 11-89-20 #2 WDW <sup>4</sup>	COC64164	T11S, R89W, S20	SWNE
34	ALT 11-90-23 #1 WDW <sup>4</sup>	COC42314	T11S, R90W, S23	NENE
35	ALT 11-90-25 #1 WDW <sup>4</sup>	COC64172	T11S, R90W, S25	NWNW
36	ALT 12-89-7 #2 WDW <sup>4</sup>	COC66704	T12S, R89W, S7	SENW

<sup>1</sup> Analysis area for each well pad includes approximately 40 acres surrounding the proposed well head location. Legal location based on proposed location of well head.

<sup>2</sup> Well head location for proposed wells subject to on-site review following submittal of APD.

<sup>3</sup> Co-located on a single well pad.

<sup>4</sup> Water disposal well.

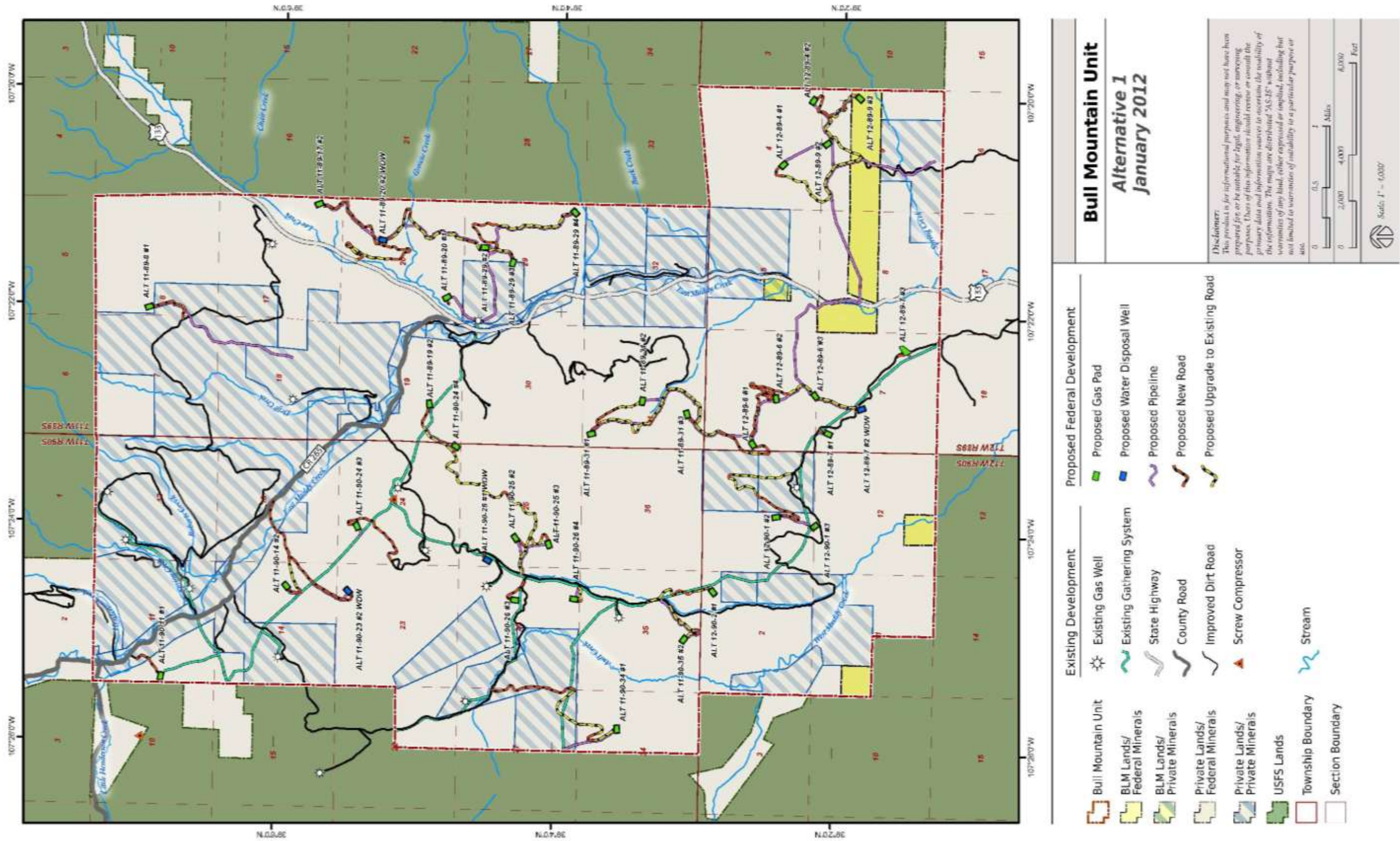


Figure 5. Alternative 1

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## NO ACTION ALTERNATIVE

The No Action Alternative includes continuation of existing federal authorizations on 13 existing well pads, continued operation of existing fee wells targeting fee minerals, and development of 11 new well pads and 55 new wells on fee surface targeting fee minerals, as summarized in Table 6a. In addition, 11 new wells would be drilled on existing well pads. The No Action Alternative would occur even if the Proposed Action or Alternative 1 are not approved. Elements of the No Action Alternative are not a part of the Proposed Action or Alternative 1.

**Table 6a. Proposed Well Pads and Wells, No Action Alternative**  
(Based on 5 wells per new pad and 1 additional well per existing pad)

	WELL PAD TYPE		Totals
	Gas	Water Disposal	
<b>New well pads</b>	11	0	11
<b>New wells</b>			
• CBNG	28	0	28
• Shale Gas	27	0	27
• Water Disposal	0	0	0
<b>Total new wells on new pads</b>			<b>55</b>
<b>Existing well pads</b>	12	1	13
<b>Existing wells</b>			
• CBNG	16	0	16
• Water Disposal	0	1	1
<b>New wells</b>			
• CBNG	6	0	6
• Shale Gas	5	0	5
<b>Total new wells, existing pads</b>			<b>28</b>
<b>Grand total wells, new and existing pads</b>			<b>83</b>

The types of associated facilities and infrastructure to support the No Action Alternative would be similar to the Proposed Action and would also include four flowback pits. Known as the McIntyre flowback pits, they would be constructed on private surface as authorized by Gunnison County and COGCC and are discussed in detail in the Water Resources section.

The main elements of the No Action Alternative are identified in Table 6b.

**Table 6b. Main Elements of No Action**

Element	Amount	Acres of Surface Disturbance	
		Construction Phase	Production Phase
Well pad sites <sup>1</sup>	<b>24 total</b>	<b>42.1</b>	<b>29.6</b>
Natural gas well pads	23	42.1	28.5
Water disposal well pads	1	0.0	1.2
Flowback pits	<b>4 total</b>	<b>19.0</b>	<b>10.4<sup>2</sup></b>
Access roads	<b>21.6 mi. total</b>	<b>45.9</b>	<b>40.3</b>
Existing improved roads	16.4 mi.	30.2 <sup>3</sup>	30.2 <sup>3</sup>
Upgrades to existing two-track roads	2.3 mi.	7.0	4.5
Construction of new roads <sup>4</sup>	2.9 mi.	8.7	5.6
Pipelines <sup>5</sup>	<b>11.3 mi. total</b>	<b>54.5</b>	<b>0.0<sup>6</sup></b>
Co-located with roads	2.4 mi.	4.3	0.0
Not co-located with roads	8.9 mi	50.2	0.0
<b>Total surface disturbance</b>		<b>161.5</b>	<b>80.3</b>
<b>Total new surface disturbance (excludes existing roads)</b>		<b>131.3</b>	<b>50.1</b>

<sup>1</sup> Initial construction disturbance for all well pads would include reserve pit backfill, cut-and-fill slopes, and buffer area.

<sup>2</sup> Flowback pits would be reclaimed in their entirety following their useful lifespan.

<sup>3</sup> Existing roads represent unreclaimed surface disturbance used in connection with this action.

<sup>4</sup> 16-foot-wide drivable road surface; 25-foot-wide construction disturbance. For access roads, this includes all surface disturbance resulting from the construction of the proposed road, excluding the roadbed itself (heavy equipment operation and cut/fill areas along road shoulders of road that would be reclaimed following construction).

<sup>5</sup> Acreage based on an average 50-foot-wide pipeline construction corridor.

<sup>6</sup> After the pipeline is constructed and buried, the disturbed area would be reclaimed in its entirety.

Construction of additional well pads, access roads, and pipelines would disturb a total of 131.3 acres within the Unit. No new electrical lines would be needed since there would be no new water disposal wells. Proposed well pad locations are identified in Table 6c and on Figure 6.

**Table 6c. Existing and Proposed Well Locations, No Action<sup>1</sup>**

	Pad No.	Lease No.	Township, Range, Section	Quarter <sup>2</sup>
<b>EXISTING</b>				
1	Falcon Seaboard 11-90-12 #1 <sup>3</sup>	n/a	T11S R90W S11	SWNW
	Falcon Seaboard 11-90-12 #1a <sup>3</sup>	n/a	T11S R90W S11	NWNW
2	Falcon Seaboard 11-90-11 #2	n/a	T11S R90W S12	SESE
3	Falcon Seaboard 11-90-12 #2	n/a	T11S R90W S12	NWNE
4	McIntyre 11-90-14 #1	n/a	T11S R90W S14	NWSE
5	Jacobs 29-1	n/a	T11S R89W S29	NWNW
6	Federal 11-89-17 #1	COC64164	T11S R87W S17	SWNE
7	Federal 11-90-24 #1 <sup>4</sup>	COC64170	T11S R90W S24	SWNE
	Federal 11-90-24 #1a <sup>4</sup>		T11S R90W S24	SWNE
8	Federal 11-90-26 #1	COC64172	T11S R90W S26	NENE
9	Federal 11-90-35 #1	COC64171	T11S R90W S35	SWNE
10	Cowskull 11-89-18 #1 <sup>5</sup>	n/a	T11S R89W S18	NESW
	Cowskull 11-89-18 #2 <sup>5</sup>	n/a	T11S R89W S18	NESW

**Table 6c. Existing and Proposed Well Locations, No Action<sup>1</sup>**

	<b>Pad No.</b>	<b>Lease No.</b>	<b>Township, Range, Section</b>	<b>Quarter<sup>2</sup></b>
11	Pasco Spadafora #2 <sup>6</sup>	n/a	T11S R90W S27	NENE
	Pasco Spadafora #3 <sup>6</sup>	n/a	T11S R90W S27	NENE
12	HL 11-89-19-#1	n/a	T11S, R89W, S19	SENE
13	Federal 24-2 WDW	COC64170	T11S R90W S24	NWSW
<b>PROPOSED<sup>7</sup></b>				
1	Falcon Seaboard 11-89-7 #1	n/a	T11S, R89W, S7	NWNE
2	Falcon Seaboard 11-89-7 #2	n/a	T11S, R89W, S7	SWSW
3	Falcon Seaboard 11-89-18 #2	n/a	T11S, R90W, S18	NENE
4	Jacobs 11-89-18 #3	n/a	T11S, R89W, S1	SESE
5	Borich 11-89-32 #1	n/a	T11S, R89W, S1	NWSE
6	Falcon Seaboard 11-90-12 #3	n/a	T11S, R90W, S12	NESW
7	Falcon Seaboard 11-90-13 #1	n/a	T11S, R90W, S13	SWNE
8	McIntyre 11-90-23-#1	n/a	T11S, R90W, S23	SESW
9	Hughes 11-90-26 #2	n/a	T11S, R90W, S26	SWSW
10	Volk 12-89-9 #2	n/a	T11S, R89W, S1	SESW
11	Eck 12-90-1- #1	n/a	T11S, R89W, S1	NENE

<sup>1</sup> Analysis area for each well pad includes approximately 40 acres surrounding the proposed wellhead location.

Legal location based on well head location.

<sup>2</sup> Well head location subject to on-site review following submittal of APD.

<sup>3, 4, 5, 6</sup> Co-located on a single well pad.

<sup>7</sup> Up to 5 wells could be drilled on each fee/fee well pad. The No Action Alternative does not analyze additional wells on existing federal pad sites.

Best management practices applied to construction, drilling and completion, production, interim reclamation, workovers or recompletion, final abandonment, final reclamation, and weed management would continue to be applied to existing approved authorizations, and they would generally be applied to the same aspects of development as presented in the Proposed Action. The Bull Mountain Unit would exist in its present form until 2014, at which time it would contract to the participating areas held by production. The Unit could contract earlier if diligent drilling had not occurred, or if the BLM or SG requested early contraction.

The development of the 11 new well pads would have no BLM oversight. With no federal action, no NEPA analysis would be required; however, other state and local regulations would still apply. Natural gas would be routed to the Bull Mountain Pipeline and delivered to regional and national markets.

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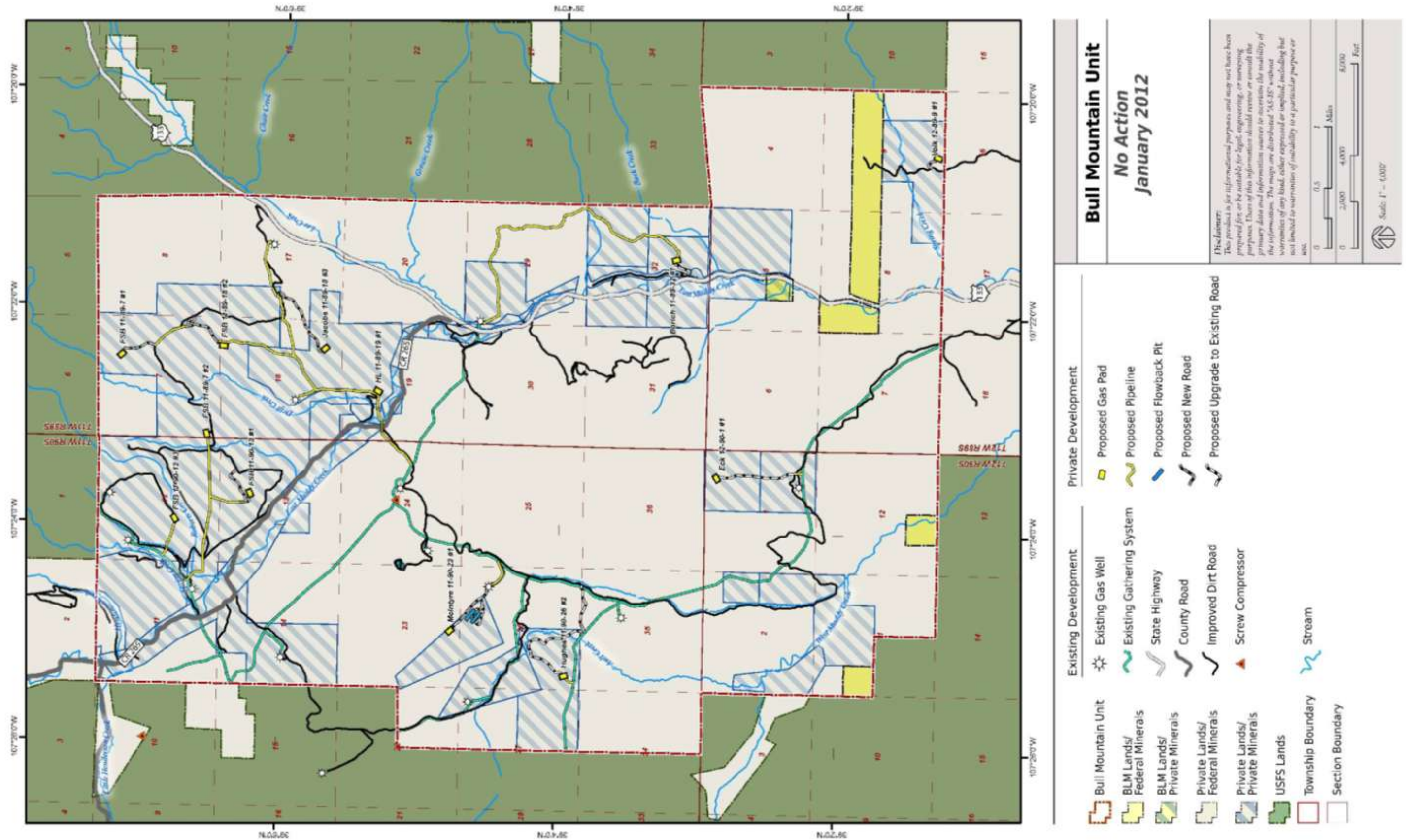


Figure 6. No Action Alternative

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## COMPARISON OF ALTERNATIVES

Total new surface disturbance for the Proposed Action, Alternative 1, and No Action are summarized in Table 7.

**Table 7. Total Surface Disturbance by Alternative (New Disturbance Only)**

	Proposed Action	Alternative 1	No Action
<b>Facilities</b>			
Well pads (natural gas and water disposal)	36	36	11
Flowback pits	0	0	4
Natural gas wells	146	146	55
Water disposal wells	4	4	0
Miles of access roads	25.7	22.4	5.2
Miles of pipelines	22.1	16.1	11.3
Power poles for overhead electrical lines	14	8	0
<b>Total acres of new disturbance</b>			
Construction phase	286.9	255.8	131.3
Percentage of total project area	1.46%	1.30%	0.67%
Production phase	105.7	99.5	50.1
Percentage of total project area	0.54%	0.51%	0.25%

Total existing and new surface disturbance for the Proposed Action, Alternative 1, and No Action are summarized in Table 8. For comparison purposes, the estimated construction disturbance (the period of time during which construction and drilling of the wells would be completed) and production disturbance (the life of the wells, including the period required for successful reclamation following abandonment of the wells) are shown for all of the alternatives. For the No Action Alternative, short-term disturbance has been reclaimed for existing facilities and therefore is not included in the total.

**Table 8. Total Surface Disturbance by Alternative (Existing and New)**

	Proposed Action <sup>1</sup>	Alternative 1 <sup>1</sup>	No Action
<b>Facilities</b>			
Well pads (gas and water disposal)	41	41	24
Flowback pits	0	0	4
Natural gas wells	151	151	83
Water disposal wells	5	5	1
Miles of access roads	36.4	34.1	40.3
Miles of pipelines	38.9	32.9	28.1
Power poles for overhead electrical lines	18	12	4
<b>Total acres disturbed</b>			
Construction phase	307.1	277.7	161.5
Percentage of total project area	1.56%	1.41%	0.83%
Production phase	125.9	121.4	80.3
Percentage of total project area	0.64%	0.62%	0.41%

<sup>1</sup> All figures shown for the Proposed Action and Alternative 1 include *federal wells only*.

### ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD:

Two additional alternatives were considered during this environmental review process. For different reasons, explained below, these alternatives were eliminated from the analysis.

**500-foot development setback.** During scoping, the Gunnison County Temporary Regulations for Oil and Gas Operations (GTOGR) were discussed, and implementation of a required 500-foot development setback from waterways and riparian areas (vs. a 300-foot setback for the Proposed Action) was considered.

SG and the BLM agreed to modify the GIS modeling program to incorporate this 500-foot setback from waterways and riparian areas. The resulting well site locations would have required an additional 5.6 miles of access roads and an additional 8.3 acres of long-term surface disturbance as compared to Alternative 1. This alternative also placed development higher on ridges and side-slopes. Therefore, the alternative was considered but eliminated from further analysis due to increased surface impacts associated with roads and ridge development, which was counter to comments received during scoping.

**Proximity to road networks.** Another alternative considered but not carried forward was in response to agency scoping which raised the issue of the overall length of roads and the amount of surface disturbance under the Proposed Action as an environmental concern. The BLM developed a set of weights and values for the GIS model criteria that would minimize road lengths and therefore surface disturbance, emphasizing proximity to existing road networks while reducing the weights on surface water and surrounding buffer zones. This alternative failed to meet the project purpose and need of the proposal; adequately and efficiently draining the Bull Mountain Unit of the natural gas resources per the Unit agreement. The well pad locations produced from the modified model were not uniformly distributed throughout the Unit and occurred in high-density groups in close proximity to existing roads, and many pad sites were within 300 feet of waterways. As a result, large portions of the Unit were excluded from development and approximately half of the Unit's natural gas resource would have been drained. This alternative was considered but eliminated from further analysis because it did not meet the purpose and need for the proposal, and it was not consistent with the existing Unit agreement to efficiently develop the federal mineral resources.

### SCOPING AND ISSUES:

Project scoping conducted in 2008 and 2009 identified the following issues of key environmental, social, and economic concern:

- **Air quality.** How will harmful emissions and dust from construction and operations be monitored and controlled?
- **Water quality and supply.** How will hydraulic fracturing and reinjection of produced water affect the short-term and long-term quality and supply of water for agricultural and residential use? What are the potential hazards from surface spills and various substances used during drilling and production? An inventory and performance monitoring program should be instituted to establish a baseline and provide regular reporting for the life of the project.
- **Threatened, Endangered, and Sensitive Wildlife Species.** What are the potential impacts to species identified as threatened, endangered, or of concern to state and federal agencies, including Canada Lynx and Gunnison sage-grouse?
- **Wildlife and wildlife habitat.** The area is used by a wide variety of species, including a large population of elk, and the potential impacts, duration, and density of development in this relatively undeveloped area is a concern. How will construction and ongoing use of access roads affect wildlife habitat utilization and connectivity within and adjacent to the Unit?

- **Recreation and Visual Resources.** The Unit is adjacent to important recreation areas for camping, hunting, and sightseeing, and includes a segment of the West Elk Scenic Byway. How will the project affect access to and quality of recreation and visual resources?
- **Socio-economics.** How will development and operation of additional roads and infrastructure affect the rural character, lifestyle, and property values in the area, as well as tourism that relies on existing recreational and scenic values? What are the positive and negative economic impacts of developing the mineral resource?
- **Transportation.** How will increased traffic and resulting impacts on road conditions, maintenance, and safety be addressed? How will new pipeline and access road corridors be minimized?

#### PLAN CONFORMANCE REVIEW:

The Proposed Action and Alternative 1 are subject to and have been reviewed for conformance with the following plan (43 CFR 1610.5, BLM 1617.3):

Name of Plan: Uncompahgre Basin Resource Management Plan (UBRMP)

Date Approved: July, 1989

Decision Number/Page: Management Unit 16, Pages 28 and 32.

Decision Language: Federal oil and gas estate will be open to leasing. Seasonal restrictions are required on crucial deer and elk winter range and on bald eagle hunting habitat to protect crucial deer and elk winter range and bald eagle hunting habitat from disturbance.

This EA is prepared under the authority of NEPA and federal regulations found in 40 CFR Part 1500. Exploration and development of federal oil and gas resources by private industry is an integral part of the BLM's oil and gas program under authority of the Mineral Leasing Act of 1920, as amended; the Mining and Minerals Policy Act of 1970; the National Materials and Minerals Policy, Research and Development Act of 1980; and the Federal Onshore Oil and Gas Leasing Reform Act of 1987, Endangered Species Act of 1973, and National Historic Preservation Act of 1966, and various other rules and policy specific to implementation of those laws.

The Proposed Action is subject to federal, state, and local permits and approvals as listed in Table 9.

**Table 9. Major Federal, State, and Local Permits and Approvals that Apply to the Bull Mountain Unit**

Agency	Permit, Approval, or Action
U.S. Army Corps of Engineers	<ul style="list-style-type: none"> <li>• 404 and 401 permits for compliance with Clean Water Act</li> </ul>
U.S. Bureau of Land Management	<ul style="list-style-type: none"> <li>• NEPA</li> <li>• Approval of the APDs</li> <li>• Sundry notices for construction and other changes</li> </ul>
U.S. Environmental Protection Agency	<ul style="list-style-type: none"> <li>• Spill Prevention, Control, and Countermeasure Plan (SPCC)</li> </ul>
U.S. Fish and Wildlife Service	<ul style="list-style-type: none"> <li>• Section 7 Consultation for compliance with Endangered Species Act</li> </ul>
District Court - Water Division 4	<ul style="list-style-type: none"> <li>• Water Augmentation Plan</li> </ul>
Colorado Parks and Wildlife	<ul style="list-style-type: none"> <li>• Coordination regarding impacts of wildlife and state sensitive species</li> </ul>
Colorado Oil and Gas Conservation Commission	<ul style="list-style-type: none"> <li>• Coordination on APDs (including Oil and Gas Location Assessment)</li> </ul>

**Table 9. Major Federal, State, and Local Permits and Approvals that Apply to the Bull Mountain Unit**

Agency	Permit, Approval, or Action
	<ul style="list-style-type: none"> <li>• Compliance with COGCC Rules and Regulations</li> </ul>
Colorado Department of Public Health and Environment	<ul style="list-style-type: none"> <li>• Construction Discharge Permit for stormwater discharges during project construction (according to current stormwater management plan)</li> <li>• Coordination with COGCC for Injection Permit Applications</li> <li>• Water Well Permit</li> <li>• Air Quality Permits and Air Pollutant Emissions Notices (APEN) for stationary and portable sources</li> </ul>
Colorado Department of Transportation	<ul style="list-style-type: none"> <li>• Access permits for access to and from Highway 133</li> <li>• Utility, relocation, and special use permit for work in the highway right-of-way</li> <li>• Oversize/overweight vehicle permits for use of state highway</li> </ul>
Gunnison County	<ul style="list-style-type: none"> <li>• Application for an Oil &amp; Gas/land use change Permit</li> <li>• Performance/utilization bond</li> <li>• Driveway permits for county road access</li> <li>• Permits for use of CR 265 for overweight/oversize equipment</li> </ul>

## STANDARDS FOR PUBLIC LAND HEALTH

In January 1997, Colorado Bureau of Land Management (BLM) approved the Standards for Public Land Health (Table 10). Standards describe conditions needed to sustain public land health and relate to all uses of the public lands. The following are the approved standards:

**Table 10. Approved Standards for Public Land Health**

Standard	Definition/Statement
#1 Upland Soils	Upland soils exhibit infiltration and permeability rates that are appropriate to soil type, climate, land form, and geologic processes. Adequate soil infiltration and permeability allows for the accumulation of soil moisture necessary for optimal plant growth and vigor, and minimizes surface runoff.
#2 Riparian Systems	Riparian systems associated with both running and standing water, function properly and have the ability to recover from major surface disturbances such as fire, severe grazing, or 100-year floods. Riparian vegetation captures sediment, and provides forage, habitat and biodiversity. Water quality is improved or maintained. Stable soils store and release water slowly.



**Table 10. Approved Standards for Public Land Health**

<b>Standard</b>	<b>Definition/Statement</b>
#3 Plant and Animal Communities	Healthy, productive plant and animal communities of native and other desirable species are maintained at viable population levels commensurate with the species and habitat's potential. Plants and animals at both the community and population level are productive, resilient, diverse, vigorous, and able to reproduce and sustain natural fluctuations, and ecological processes.
#4 Threatened and Endangered Species	Special status, threatened and endangered species (federal and state), and other plants and animals officially designated by the BLM, and their habitats are maintained or enhanced by sustaining healthy, native plant and animal communities.
#5 Water Quality	The water quality of all water bodies, including ground water where applicable, located on or influenced by BLM lands will achieve or exceed the Water Quality Standards established by the State of Colorado. Water Quality Standards for surface and ground waters include the designated beneficial uses, numeric criteria, narrative criteria, and anti-degradation requirements set forth under State law as found in (5 CCR 1002-8), as required by Section 303(c) of the Clean Water Act.

A finding for each standard must be made in the environmental analysis. These findings are located in specific elements below.

#### AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES /MITIGATION

This section provides discussion of current conditions and analysis of potential impacts from the Proposed Action, Alternative 1, and the No Action Alternative for each resource.

Cumulative impacts of the Proposed Action and Alternative 1 are shown in the analysis of each element. A description of the past, present, and reasonably foreseeable actions is at the end of this section. The elements of the No Action Alternative are reasonably foreseeable.

Elements specified by statute, regulation, executive order, or the Standards for Public Land Health are described and analyzed in this section.

The following elements of Table 11 are considerations required of NEPA. Those that could be impacted are brought forward for analysis. Any element not affected by the Proposed Action or alternatives will not be analyzed in this document; the reasons for no impact will be stated.

**Table 11. Elements Considered**

<b>Element</b>	<b>Not Applicable or Not Present</b>	<b>Present, But No Impact</b>	<b>Applicable &amp; Present; Brought Forward for Analysis</b>
Air Quality			X
ACEC	X		
Lands with Wilderness Characteristics	X		
Wilderness	X		
Wild and Scenic Rivers	X		
Cultural			X
Native American Religious Concerns	X		
Farmlands, Prime/Unique	X		
Soils			X
Vegetation			X
Invasive, Non-native Species			X
Threatened, Endangered, and Sensitive Species			X
Migratory Birds			X
Wildlife, Terrestrial			X
Wildlife, Aquatic			X
Wetlands & Riparian Zones			X
Floodplains	X		
Water Quality, Surface and Ground			X
Wastes, Hazardous or Solid			X
Environmental Justice			X

## **AIR QUALITY**

**Affected Environment:** Climate. The nearest meteorological measurements were collected at Redstone Colorado (1979-1994), approximately 2.5 miles northeast of the project area at an elevation of 8,070 feet amsl (WRCC 2011).

The annual average total precipitation at Redstone, Colorado is 27.7 inches, with annual totals ranging from 20.2 inches (1987) to 40.4 inches (1985). Precipitation is greatest in the spring and fall months. Snowfall occurs from fall through spring with the greatest amount in March. The average annual snowfall is 169.4 inches.

The region has cool temperatures, with average daily temperature (in degrees Fahrenheit [°F]) ranging between 8°F and 33°F in January to between 44°F and 76°F in July. Extreme temperatures have ranged from -29°F (1985) to 93°F (1991). Table 12 shows the mean monthly temperature ranges and total precipitation amounts.

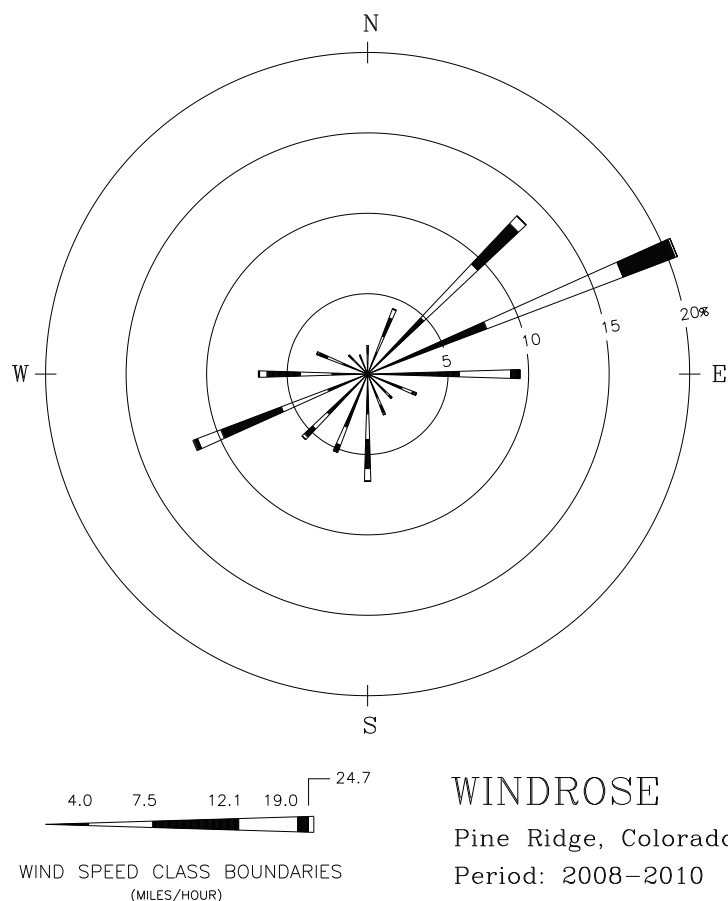


**Table 12. Mean Monthly Temperature Ranges and Total Precipitation Amounts**

Month	Average Temperature Range (°F)	Total Precipitation (inches)	Total Snowfall (inches)
January	8-33	1.8	26.0
February	12-36	2.4	29.9
March	17-43	3.1	32.4
April	25-51	2.0	12.1
May	32-61	2.3	5.3
June	39-72	1.5	0.5
July	44-76	2.2	0.0
August	44-75	1.7	0.0
September	37-67	3.0	0.5
October	28-55	3.0	6.9
November	18-39	2.6	26.4
December	9-32	2.0	29.5
ANNUAL	39.6 (mean)	27.7 (mean)	169.4

Source: WRCC 2011.

The closest comprehensive wind measurements are collected at the Pine Ridge, Colorado Remote Automated Weather Station (RAWS) (BLM, 2011), located approximated 55 miles west of the Project Area. Although local wind patterns in mountain areas are almost always controlled by local topography the Pine Ridge site is located at 6,600 feet amsl in rolling terrain and can be used to describe typical wind patterns in the Unit.



A wind rose showing a diagram of the frequency of each wind direction is shown at left for the Pine Ridge site. Wind direction is the direction from which the wind is blowing. For example, the wind is blowing from the north 1.8 percent of the time.

Tables 13 and 14 provide the wind direction distribution and wind speed distribution at that site in a tabular format. The annual mean wind speed at the Pine Ridge site is 5.6 miles per hour (mph).

**Table 13. Wind Direction Frequency Distribution, Pine Ridge, Colorado, 2008-2010**

Wind Direction	Frequency (%)	Wind Direction	Frequency (%)
N	0.018	S	0.067
NNE	0.044	SSW	0.052
NE	0.136	SW	0.056
ENE	0.206	WSW	0.116
E	0.095	W	0.068
ESE	0.033	WNW	0.034
SE	0.021	NW	0.016
SSE	0.027	NNW	0.013

**Table 14. Wind Speed Distribution, Pine Ridge, Colorado, 2008-2010**

Wind Speed (mph)	Frequency (%)	Wind Speed (mph)	Frequency (%)
0 – 4.0	43.9	12.1 – 19.0	4.9
4.0 – 7.5	30.5	19.0 – 24.7	0.5
7.5 – 12.1	20.1	Greater than 24.7	0.1

**Air Quality.** The project area is located in Gunnison County, and is within the Mountain Counties Region for air quality planning (Colorado Department of Public Health and Environment – CDPHE, 2010). The Mountain Counties Region includes counties that generally are on or near the Continental Divide. Air quality concerns in this region are primarily from impacts related to particulate pollution from wood burning and road sanding activities.

Air quality impacts from pollutant emissions are limited by regulations, standards, and implementation plans established under the Federal Clean Air Act, as administered by the CDPHE under authorization of the U.S. Environmental Protection Agency (EPA). Under the Federal Land Policy and Management Act (FLPMA) and the Clean Air Act, the BLM cannot conduct or authorize any activity which does not conform to all applicable local, state, tribal or federal air quality laws, statutes, regulations, standards, or implementation plans.

As such, significant impacts to air quality from project-related activities would result if it is demonstrated that:

- National Ambient Air Quality Standards (NAAQS) or Colorado Ambient Air Quality Standards (CAAQS) would be violated;
- Class I or Class II Prevention of Significant Deterioration (PSD) Increments would be exceeded;
- Concentrations of hazardous air pollutants or other toxic air pollutants are predicted to be above designated thresholds;
- Air Quality-Related Values (AQRVs) would be impacted beyond acceptable levels such that:
  - The project would contribute to visibility impacts that would exceed 1.0 deciview (dv) change at a Class I area,
  - Changes in nitrogen or sulfur deposition would exceed the Level of Concern (LOC)
  - Changes in lake acid neutralizing capacity are predicted to be above the Limit of Acceptable Change (LAC)

The CAAQS and NAAQS are health-based criteria for the maximum acceptable concentrations of air pollutants at all locations to which the public has access. Although specific air quality monitoring has not

been conducted within the project area, all of Gunnison County is designated as “attainment” by the CDPHE for all criteria pollutants (CDPHE, 2010). Criteria pollutants for which CAAQS and NAAQS exist include carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), particulate matter less than 10 microns in effective diameter (PM<sub>10</sub>), particulate matter less than 2.5 microns in effective diameter (PM<sub>2.5</sub>), sulfur dioxide (SO<sub>2</sub>), and lead (Pb).

Background ambient air concentrations for criteria pollutants (PM<sub>10</sub>, PM<sub>2.5</sub>, CO, NO<sub>x</sub>, O<sub>3</sub> and SO<sub>2</sub>) used as an indicator of existing conditions in the region are shown in Table 17. These values were obtained from the CDPHE (CDPHE, 2011), and from the Clean Air Status and Trends Network (CASTNET) station site near Gothic Colorado, and are compared to the CAAQS and NAAQS in Table 17. The PSD Class I and Class II increments are also provided in Table 15.

**Table 15. Monitored Air Pollutant Background Concentrations and Colorado and National Ambient Air Quality Standards (µg/m3)**

Pollutant	Averaging Time	Measured Background Concentration	Colorado and National Ambient Air Quality Standards	Incremental Increase Above Legal Baseline	
				PSD Class I	PSD Class II
Carbon Monoxide (CO)	1-hour <sup>1</sup>	1145	40,000	n/a	n/a
	8-hour <sup>1</sup>	1145	10,000	n/a	n/a
Nitrogen Dioxide (NO <sub>2</sub> )	Annual <sup>2</sup>	9 <sup>2</sup>	100	2.5	25
	1-hour <sup>2</sup>	92 <sup>2</sup>	188 (NAAQS)	n/a	n/a
Ozone (O <sub>3</sub> )	8-hour <sup>3</sup>	66	157	n/a	n/a
Particulate matter (PM <sub>10</sub> )	24-hour <sup>4</sup>	30	150	8	30
	Annual <sup>4</sup>	10	50 (CAAQS)	4	17
Particulate matter (PM <sub>2.5</sub> )	24-hour <sup>5</sup>	12	35	n/a	n/a
	Annual <sup>5</sup>	5	15	n/a	n/a
Sulfur Dioxide (SO <sub>2</sub> )	1-hour <sup>6</sup>	31	196 (NAAQS)	n/a	n/a
	3-hour <sup>7</sup>	24	1,300 (NAAQS) 700 (CAAQS)	25	512
	24-hour <sup>7</sup>	13	365	5	91
	Annual <sup>7</sup>	5	80(NAAQS) 60(CAAQS)	2	20

<sup>1</sup> American Soda, Parachute 2007-2009 (CDPHE, 2011).

<sup>2</sup> Southern Ute, 1 mile NE of Ignacio, 2006-2008 (CDPHE, 2011).

<sup>3</sup> CASTNET Gothic site, 2011

<sup>4</sup> Energy Fuels, 2008-2009 (CDPHE, 2011).

<sup>5</sup> Based on S. Ute, 7571 Hwy 5505, 2009-2010 CDPHE, 2011).

<sup>6</sup> Holcim Portland, 2007-2009 (CDPHE, 2011).

<sup>7</sup> Unocal, 1983-1984 (CDPHE, 2011).

Federal air quality regulations adopted and enforced by the CDPHE limit incremental emissions increases to specific levels defined by the classification of air quality in a specific area. The PSD Program is designed to limit the incremental increase of specific air pollutant concentrations above a legally defined baseline level. Incremental increases allowed in PSD Class I areas are strictly limited; increases allowed in Class II areas are less strict.

The project area and surrounding areas are classified as PSD Class II. The PSD Class I area located closest to the Unit is the Maroon Bells – Snowmass Wilderness Area, which is approximately 5.6 miles to the east. Other PSD Class I areas located within 62.1 miles (100 kilometers) of the project area include the West Elk Wilderness (11.2 miles south), Black Canyon of the Gunnison National Park (30.4 miles

southwest), Flat Tops Wilderness Area (44.7 miles north), and Eagle's Nest Wilderness (62.1 miles northeast) (Figure 7).

All NEPA analysis comparisons to PSD Class I and II increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD increment consumption analysis. The determination of PSD increment consumption is an air quality regulatory agency responsibility. Such an analysis would be conducted as part of the New Source Review process for a major source, as would an evaluation of potential impacts to AQRVs such as visibility, aquatic ecosystems, flora, fauna, etc., performed under the direction of the CDPHE in consultation with federal land managers.

Visibility conditions can be measured as standard visual range (SVR). SVR is the farthest distance at which an observer can just see a black object viewed against the horizon sky; the larger the SVR, the cleaner the air. Continuous visibility-related optical background data, representative of the Unit, have been collected in the PSD Class II White River Wilderness (located approximately 30 miles east of the project area), as part of the Interagency Monitoring of Protected Visual Environments (IMPROVE) program. The average SVR at the White River Wilderness is over 124.2 miles (VIEWS 2011).

### **Environmental Consequences/Mitigation:**

**Proposed Action** – Air-pollutant emissions as well as greenhouse gas (GHG) emissions would occur during construction and operations. Pollutants emitted would include PM<sub>10</sub>, PM<sub>2.5</sub>, nitrogen oxides (NO<sub>x</sub>), CO, VOCs, and SO<sub>2</sub>, and GHG emissions including carbon dioxide (CO<sub>2</sub>) methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O). Emissions would occur temporarily during well development and over the life of the project during well production operations.

Well-development emission sources include vehicle traffic, well pad, road and pipeline construction, and drilling and completion activities. Well-development sources would temporarily elevate pollutant levels but impacts would be localized and would occur only for the short-term duration of the activities. Fugitive dust emissions (PM<sub>10</sub> and PM<sub>2.5</sub>) and vehicle exhaust emissions (NO<sub>x</sub>, CO, SO<sub>2</sub>, VOC, and PM<sub>10</sub>, PM<sub>2.5</sub>) would result from work crews commuting to and from the work site and from the transportation and operation of equipment to construct the well pad, access road, and infrastructure. Fugitive dust and vehicle exhaust emissions would also occur during construction of well pads, access roads, and gathering pipelines.

Maximum pollutant emissions from well development sources would occur during well drilling. A maximum of three 1,200-horsepower (hp) diesel-fired drilling rigs would operate during drilling activities (May – November) and would emit primarily CO, NO<sub>x</sub>, SO<sub>2</sub>, VOC, and PM<sub>10</sub>/PM<sub>2.5</sub>. The drilling rigs would be EPA Tier-2 compliant engines.

During field production, emissions of NO<sub>x</sub>, CO, and VOC would occur from operation of the separator and tank heaters during the winter months. Emissions of NO<sub>x</sub>, SO<sub>2</sub>, CO, VOC, and particulate matter would also occur from workover rig engines and associated activities operating in the field. Vehicle traffic and well-maintenance activities during production would also result in emissions of fugitive dust and vehicle exhaust; however, these emissions would be localized and would occur only for the short-term duration of the activities.

Emissions associated with construction and operation of the Proposed Action would not be expected to cause or contribute to any adverse air quality conditions nor cause a violation of any applicable ambient air quality standard. In addition, the Proposed Action impacts would be expected to be less than the applicable PSD increments.

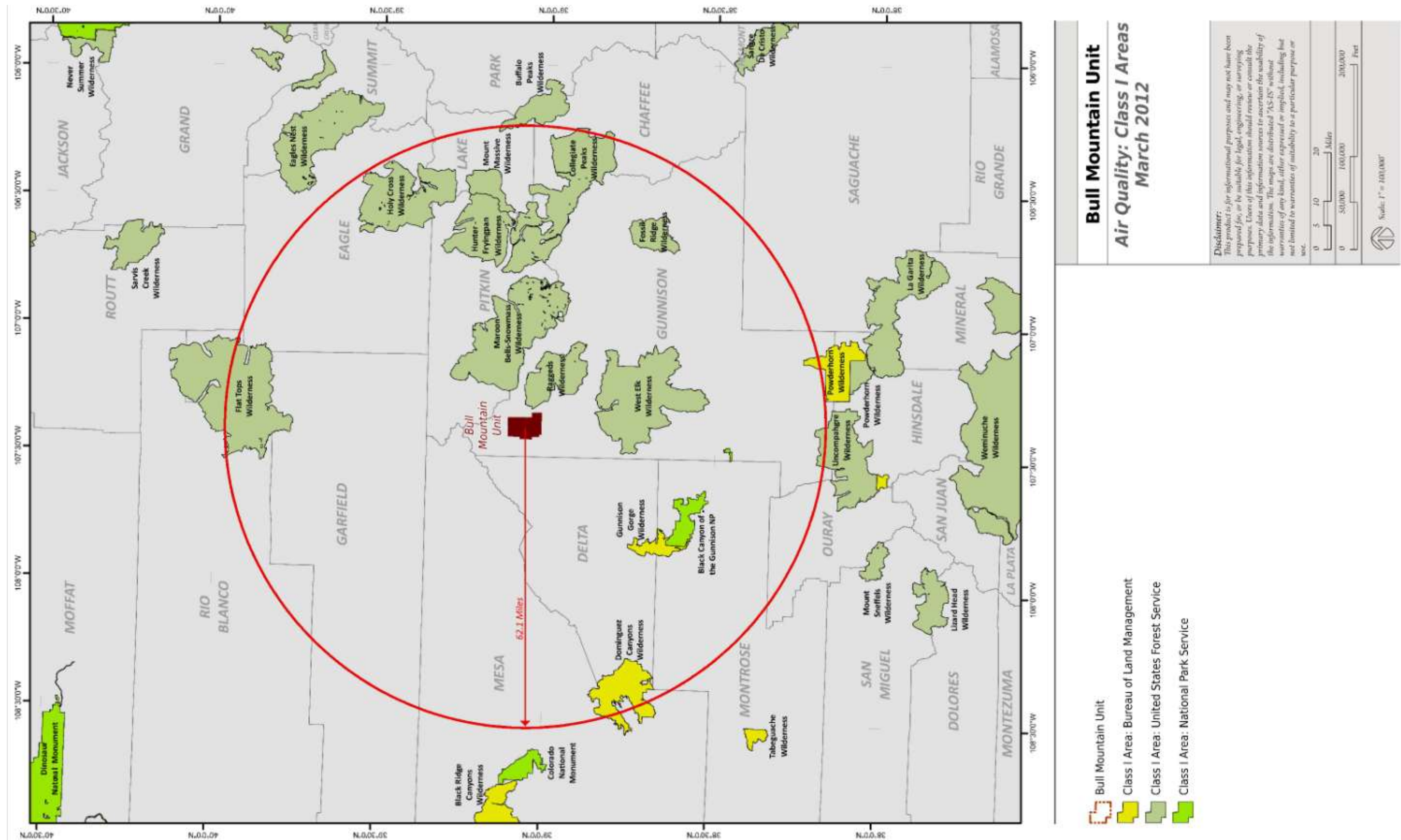


Figure 7. PSD Class I Areas

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Maximum potential greenhouse gas emissions expected for the project in metric tons per year of CO<sub>2</sub> equivalent (CO<sub>2</sub>e) would be minimal in comparison to a typical 500 MW coal-fired power plant, and well below the threshold for which federal reporting is required under 40 CFR 98, Mandatory Reporting of Greenhouse Gases (EPA 2010). No mitigation measures specific to air quality would be required.

**Cumulative Impacts** – The area of influence for air quality is considered to be the Bull Mountain Unit and the geographic area within 62.1 miles (100 kilometers) of the Unit boundaries as shown on Figure 7. Cumulative air quality impacts are defined as incremental impacts from any one alternative combined with impacts from other existing or proposed air emission sources in the region. These emission sources include existing and future coal mining and exploration, oil and gas exploration and development, livestock grazing, and regional vehicle traffic. These activities are more fully described in the Cumulative Impacts Summary beginning on page 159 of this document. The contribution from project source emissions to cumulative ambient air concentrations and AQRVs, including regional haze and atmospheric deposition at the PSD Class I Maroon Bells – Snowmass Wilderness Area, and at the other PSD Class I areas located within the area of influence (West Elk Wilderness, Black Canyon of the Gunnison National Park, Flat Tops Wilderness, and Eagle’s Nest Wilderness) would be negligible.

**Alternative 1** – The types of cumulative impacts to air quality under Alternative 1 would be the same as the Proposed Action.

**Cumulative Impacts** – The types of impacts to air quality under Alternative 1 would be the same as for the Proposed Action. However, Alternative 1 would have 2.3 fewer miles of access roads and 6 fewer miles of pipelines than the Proposed Action, with proportionately less emissions during construction and production.

**No Action Alternative** – Impacts to air quality under the No Action Alternative would be the less than the Proposed Action.

## AREAS OF CRITICAL ENVIRONMENTAL CONCERN

**Affected Environment:** No Areas of Critical Environmental Concern are located within or adjacent to the Unit.

## WILDERNESS

**Affected Environment:** No congressionally-designated wilderness, Wilderness Study Areas, or citizen-proposed wilderness areas have been identified within Management Unit 16 of the UFO which contains the Bull Mountain Unit. The nearby Raggeds Wilderness in the White River and Gunnison National Forests and the West Elk Wilderness Area in the Gunnison National Forest are managed by the U.S. Forest Service.

## LANDS WITH WILDERNESS CHARACTERISTICS

Through the Federal Land Policy and Management Act (FLPMA, Sec. 201 and 202) of 1976, Congress directed the BLM to establish and maintain an inventory of the lands under its jurisdiction that possess “wilderness characteristics.” The characteristics include (a) size (generally 5,000 acres or greater with no mechanically constructed and maintained roads, or smaller areas that share a boundary with existing wilderness or wilderness study areas of 5,000 acres or greater); (b) naturalness; and (c) outstanding opportunities for solitude, **or** primitive and unconfined types of recreation. Supplemental values (characteristic d) include ecological, geological, or other features of scientific, educational, scenic, or historical value. For an area to possess wilderness characteristics it must possess characteristics a, b, and c; d is optional.



BLM lands within the Uncompahgre Field Office were inventoried for wilderness characteristics in 2010-2011. No lands possessing wilderness characteristics were found on BLM-managed lands within or adjacent to the Unit.

## **WILD AND SCENIC RIVERS**

**Affected Environment:** No designated Wild and Scenic Rivers are located within or adjacent to the proposed project area. There are no river segments on BLM-managed lands within the Unit that have been found eligible for inclusion in the National Wild and Scenic River System.

## **CULTURAL RESOURCES**

**Affected Environment:** The area has been inhabited by humans for approximately 10,000–12,000 years. Early inhabitants are characterized as Paleoindian hunters of big game and Archaic small-game hunters and gatherers (BLM 1984). Current land uses within the Unit include cattle and sheep grazing, oil and gas exploration, and residential development.

To date there have been 22 cultural resource investigations within or overlapping the Unit resulting in the identification of two archaeological sites and five isolated artifacts (isolated finds). The archeological sites date to the Historic Period and include a ranch that is eligible for inclusion in the National Register of Historic Places (NRHP) and a transportation corridor (roadway; field-recommended ineligible for inclusion in the NRHP, no official determination made). Isolated finds include both prehistoric and historic artifacts.

Although very few previous surveys have been conducted in the area to date, it is clear that cultural resources are limited. It is likely that travel in the area was restricted by the geographic features and thick vegetation, thus limiting prehistoric human use to ephemeral activities and resulting in fewer artifacts and features than might typically be expected. Historic use of the area appears to be more common and includes roads and small ranch settings. It can also be assumed that historic water features such as ditches and ponds are scattered across the Unit.

### **Environmental Consequences/Mitigation:**

**Proposed Action** – Under the Proposed Action one NRHP-eligible cultural property could be directly impacted. In addition, there is potential for additional historic and prehistoric sites to occur within the Unit. Indirect impacts to undiscovered cultural resources may occur as a result of increased erosion and increased site visitation due to new access. Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to cultural resources. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The cumulative impacts assessment area for cultural resources is considered to be the Bull Mountain Unit. A qualified archaeologist would be present to monitor construction during the ground-disturbing portion of project build-out. As such, there would be no additional cumulative impacts.

**Alternative 1** – No known cultural resources would be impacted under Alternative 1. There is, however, potential for both prehistoric and historic sites to be found within the Unit, and for indirect impacts to occur as described under the Proposed Action. Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to cultural resources.

**Cumulative Impacts** – A qualified archaeologist would be present to monitor construction during the ground-disturbing portion of project build-out. As such, there would be no additional cumulative impacts.

**No Action Alternative** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would develop up to 55 new wells on 11 well pads on fee surface and would add up to 11 wells to existing well pads. There would be potential for impact to one ineligible cultural property. Because this property is ineligible for inclusion on the NRHP, no avoidance measures would be required. However, both prehistoric and historic sites could potentially be found within the Unit. Indirect impacts could also occur as described under the Proposed Action.

## **NATIVE AMERICAN RELIGIOUS CONCERNS**

**Affected Environment:** No evidence of the presence of Native peoples has been found during previous cultural surveys on federal lands within the Unit.

**Environmental Consequences/Mitigation:** See the Cultural Resources section for a discussion of potential direct, indirect, and cumulative impacts should any Native American cultural site be found within the project area.

## **FARMLANDS, PRIME AND UNIQUE**

**Affected Environment:** No prime or unique farmlands as identified by the Natural Resources Conservation Service (NRCS) have been identified in the vicinity of the Unit (NRCS, 2011).

## **SOILS** (includes a finding on Standard 1)

**Affected Environment:** Approximately 15 classified soil types are found within the Unit per the USDA Natural Resource Conservation Service (NRCS), some of which are differentiated based on percent of slope in the Unit. Many have similar characteristics, and 85% are within the Fughes Series and Bulkley Series. Soils derived from the Fughes Series are derived from old alluvium and complex landslide deposits. They are deep, well-drained, and typically found on alluvial fans, uplands, and valley side-slopes. Their texture is heavy clay loam with 36-50% clay. The Bulkley soil series is derived from fine-textured alluvium eroded from shale and interbedded sandstone sedimentary rocks. The texture is clay or silty clay loam with weathered shale, typically found at depths of approximately 3-6 feet. Approximately 7% of the soils are within the Torriorthents complex, a highly variable, generally shallow silty clay or silty clay loam. The Torriorthents complex is typically found in moderately steep to very steep areas with bedrock outcrops of sandstone, shale, and interbedded shale and sandstone. These soils are generally deeper at the base of slopes and are well-drained. Their outcrops include the Wasatch and Mesaverde Formations.

Within these soils are fine-grained, poorly consolidated associations that have Severe erosion hazard ratings. Their suitability rating for roads is Poor due to limitations of slope and low shear strength. Both soils units are classified within Hydrologic Group C. They typically exhibit low infiltration rates when wetted and often have a layer that impedes downward migration of water. These soils have moderately fine to fine texture and have a low rate of water transmission (0.05 – 0.15 in/hr). Table 16 and Figure 8 show the erosion ratings for soils in the Bull Mountain Unit.

**Table 16. Soil Erosion Ratings for the Bull Mountain Unit**

<b>Rating</b>	<b>Total Acres</b>	<b>Percent of Unit</b>
Slight (light green)	2,363.8	12%
Moderate (yellow)	8,972.2	45%
Severe (orange)	6,799.6	35%
Very severe (red)	1,537.7	8%
<b>Totals</b>	<b>19,673.3</b>	<b>100%</b>

**Environmental Consequences/Mitigation:**

**Proposed Action** – Construction of access roads, well pads (including reserve pits), power lines, and pipelines would initially disturb approximately 286.9 acres (1.46% of the project area). Once interim reclamation is complete, production disturbance would be about 125.9 acres (0.64% of the project area), a reduction of approximately 44% overall. Potential impacts to soils from the Proposed Action include loss of soil productivity and increased susceptibility to erosion. Loss of soil productivity can result from the mixing of soil horizons when subsurface soils are brought to the surface and mix with or replace surface soils. The result can be less biologically productive surface soils due to elevated soil pH, increased soil salinity, higher sodium and calcium carbonate concentrations, decreased levels of soil nutrients and organic matter, and altered soil structure, texture, and rock content. The effects of soil mixing would be minimized or eliminated through proper soil handling and salvaging and prompt attention to soil stabilization using BMPs as described in Appendix C.

Compaction of soil during construction and production activities can also reduce soil productivity. Soil compaction impacts soil structure and reduces pore size. Excessive compaction can reduce water infiltration and permeability of water through the soil; reduce diffusion of oxygen, carbon dioxide, and other gases into and out of the soil; reduce plant root penetration; and reduce plant growth and production. The effects of compaction would be reduced at the time of reclamation through sound site-preparation BMPS as described in Appendix C.

Spilled frack fluids, drilling fluids, and produced water can also lead to loss of soil productivity during construction and production activities. Depending on the size and type of spill, the effect on soils will vary considerably. The largest threat to soil productivity is the release of produced water onto the soil surface simply because of the volume and force of the water. Released hydraulic fracturing fluids, drilling fluids, and produced water—in sufficient quantity—can lead to the creation of saline and/or sodic soil conditions. Saline soils can interfere with plant germination and growth, and sodic soils can become hard and crusted with effects similar to those of compacted soils. The effects of spilled drilling fluids, hydraulic fracturing fluids, and produced water would be minimized through proper implementation of the Spill Prevention, Control and Countermeasure Plan as described under Wastes, Hazardous and Solid, and the use of approved disposal methods for the produced water discussed in Water Resources.

Susceptibility to erosion is increased when construction and production activities disturb the soil resource. Areas with steep slopes are prone to erosion regardless of soil type. The possibility of increased erosion at well sites, especially those sites constructed in steeper terrain, can be reduced through proper implementation of erosion-control methods and successful, timely reclamation of disturbed areas. The Severe erosion hazards associated with these potentially affected soils units highlight the importance of diligent application of Best Management Practices for proposed soil-disturbing activities. Revegetation, erosion control mats, and water bars to divert stormwater runoff have been successfully used in existing development of the Unit.

All of the existing and proposed access roads for the Unit are surfaced with dirt or gravel and are therefore susceptible to dust formation and subsequent wind erosion during periods of dry weather. During construction, well pad surfaces, topsoil piles, and pipeline corridors would also be subject to

erosion from wind and precipitation, creating a potential loss of viability for reclamation purposes. Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to soil resources from generation of dust and potential wind and water erosion. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The cumulative impacts assessment area for soil is considered to be the Bull Mountain Unit and the vicinity within the Muddy Creek basin. Cumulative impacts to soils would occur across the Unit from the reasonably foreseeable combined implementation of the No Action Alternative along with the Proposed Action. Based upon the amount of surface disturbance associated with the Proposed Action, the likely incremental cumulative impact of productivity loss and erosion on the existing soil resource would be low. With successful implementation of soil salvaging and reclamation, it is expected that soil productivity and soil erosion losses in the Unit would be controlled and therefore minimal cumulative impacts would occur. It is likely that planned activities would add to fine sediment delivery to drainage systems, but this increased delivery would be over a period of years during project build-out and would not likely be noticeable given the natural background loading of silts that creeks and streams in the Muddy Creek basin already carry.

**Alternative 1** – Construction of access roads, well pads, power lines, and pipelines would initially disturb approximately 255.8 acres (1.3% of the project area). Once interim reclamation is complete, production disturbance would be about 121.4 acres (0.62% of the project area), a reduction of about 47% overall. Potential impacts to soils from the Alternative 1 would be similar to impacts from the Proposed Action. Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to soil resources from generation of dust and potential wind and water erosion. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The types of cumulative impacts to soils that could occur across the Unit from the combined implementation of Alternative 1 and the No Action Alternative would be the same as those for the Proposed Action. Alternative 1 would have 3.3 fewer miles of construction impacts to soils from new or improved roads, 2.3 fewer miles of access roads overall, and 6 fewer miles of pipelines than the Proposed Action, with proportionately less impacts to soils during construction and production.

**No Action** – Construction of access roads, well pads, power lines, pipelines, and flowback pits would initially disturb approximately 131.3 acres (0.67% of the project area). Once interim reclamation is complete, production disturbance would be about 80.3 acres (0.41% of the project area), a reduction of about 60% overall. The types of potential impacts to soils from the No Action Alternative would be similar to impacts from the Proposed Action.

**Finding on the Public Land Health Standard for soils:** (partial; see also Vegetation; Invasive and Non-native Species): Based on the Land Health Assessment for the North Fork Landscape (BLM 2007), surface lands managed by the BLM have been identified as having some ongoing soil and vegetation issues associated with the long-term use of the Spring Creek Trail as an existing (and historic) stock driveway that sees heavy cattle utilization, and is also an active OHV trail. Soils issues include small areas with excessive bare soils, low plant and litter cover, low cool-season grass cover, low forb cover, minor noxious weed infestations, poor drainage, and shrubs with poor vigor. These issues are associated with heavy and persistent cattle grazing pressure, trampling of vegetation, high concentrations of elk and mule deer winter browsing, and the continued use of the Spring Creek Trail which is a historic route that was not likely designed to handle OHV use and long-term and persistent disturbances associated with cattle drives and heavy grazing pressure. The Proposed Action would see a pipeline route and new access road crossing BLM lands that do have existing soils issues associated with the stock driveway. However, with proper implementation of proposed BMPs and reclamation, long-term soil health and function would be maintained and the land health standard would continue to be met. Monitoring of additional natural gas development activities in areas with existing soils issues would be necessary, as cattle grazing pressure

and trampling can be counter to reclamation efforts, and cause failure of reclamation and soil stabilization efforts. The Proposed Action, Alternative 1, and No Action would not jeopardize soil health in the Unit given the proposed BMPs and reclamation standards, but timely installation and maintenance of livestock exclosures would be necessary to allow for reclamation to be successful, particularly on steep slopes, in wetlands, and in livestock loafing areas.



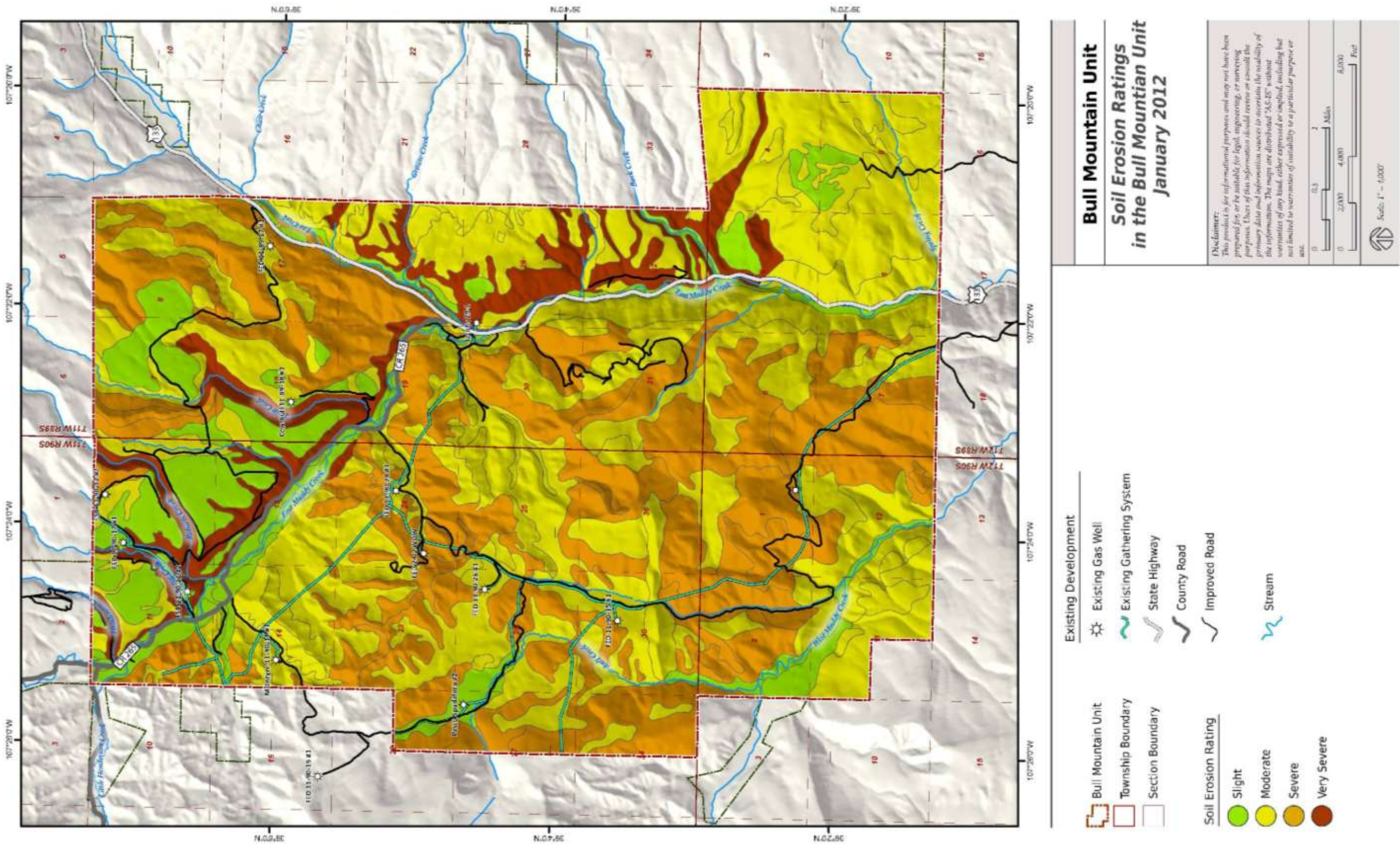


Figure 8. Soil Erosion Ratings in the Bull Mountain Unit



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## VEGETATION (includes a finding on Standard 3)

**Affected Environment:** This section tiers to the Biological Evaluation (Petterson 2012). Vegetation communities found within the Unit are listed in Table 17 and shown on Figure 9:

The following are descriptions of the major community types:

Gambel's Oak Shrubland – This diverse community type is found at middle elevations of the project area. The amount of Gambel's oak ("oakbrush") varies, depending primarily on elevation and aspect. In some areas, the type consists almost entirely of dense, tall oakbrush with few associated shrubs and a sparse herbaceous understory due to extreme shading by the oak canopy and competition for light, moisture, and space. In areas of elevated soil moisture, another tall shrub, chokecherry, is sometimes present and locally co-dominant. On slightly drier exposures, the oakbrush shares dominance with Saskatoon serviceberry. More open stands may include snowberry (*Symphoricarpos rotundifolia*) in the understory, occasionally accompanied by wax currant (*Ribes cereum*).

Mixed Mountain Shrubland – On drier slopes at lower elevations or on sunnier aspects, the habitat is dominated by Utah serviceberry and some Saskatoon serviceberry and varying amounts of chokecherry, sagebrush, snowberry, and Gambel's oak. Because of the more open canopies of these shrubs, the herbaceous layer is denser and more diverse. Associated forbs vary with elevation, site moisture, and shrub density but commonly include tailcup lupine (*Lupinus caudatus*), Rocky Mountain penstemon (*Penstemon strictus*), Watson's penstemon (*Penstemon watsonii*), aspen daisy (*Erigeron speciosus*), running fleabane (*Erigeron flagellaris*), Drummond's rockcress (*Boechera drummondii*), Nuttall's larkspur (*Delphinium nuttallianum*), small-leaf pussytoes (*Antennaria parviflora*), lambs-tongue groundsel (*Senecio integerrimus*), longleaf phlox (*Phlox longifolia*), sticky false starwort (*Pseudostellaria jamesii*), and narrowleaf mountain trumpet (*Collomia linearis*). Native perennial graminoids include elk sedge (*Carex geyeri*) and a variety of grasses such as bluebunch wheatgrass (*Pseudoroegneria spicata*), slender wheatgrass (*Elymus trachycaulus*), and junegrass (*Koeleria macrantha*).

**Table 17. Existing Vegetation Communities in Bull Mountain Unit**

Vegetation Type	Existing Conditions	
	Acres	% of Unit
Aspen	1,123.9	5.7%
Aspen/Conifer	12.3	0.1%
Aspen/Oak	768.8	3.9%
Disturbed Area	174.7	0.9%
Irrigated Meadow	1,981.0	10.1%
Meadow	552.6	2.8%
Mixed Conifer	62.5	0.3%
Mixed Mountain Shrub	1,753.5	8.9%
Oakbrush	3,991.5	20.3%
Pinyon/Juniper	129.3	0.7%
Riparian Woodland	87.3	0.4%
Rock Outcrop	1.5	0.0%
Sagebrush	8,257.4	42.0%
Wetland/Riparian Area	671.8	3.4%
Willow	16.1	0.1%
Open Water	88.8	0.5%
<b>Total</b>	<b>19,672.9</b>	<b>100.0%</b>

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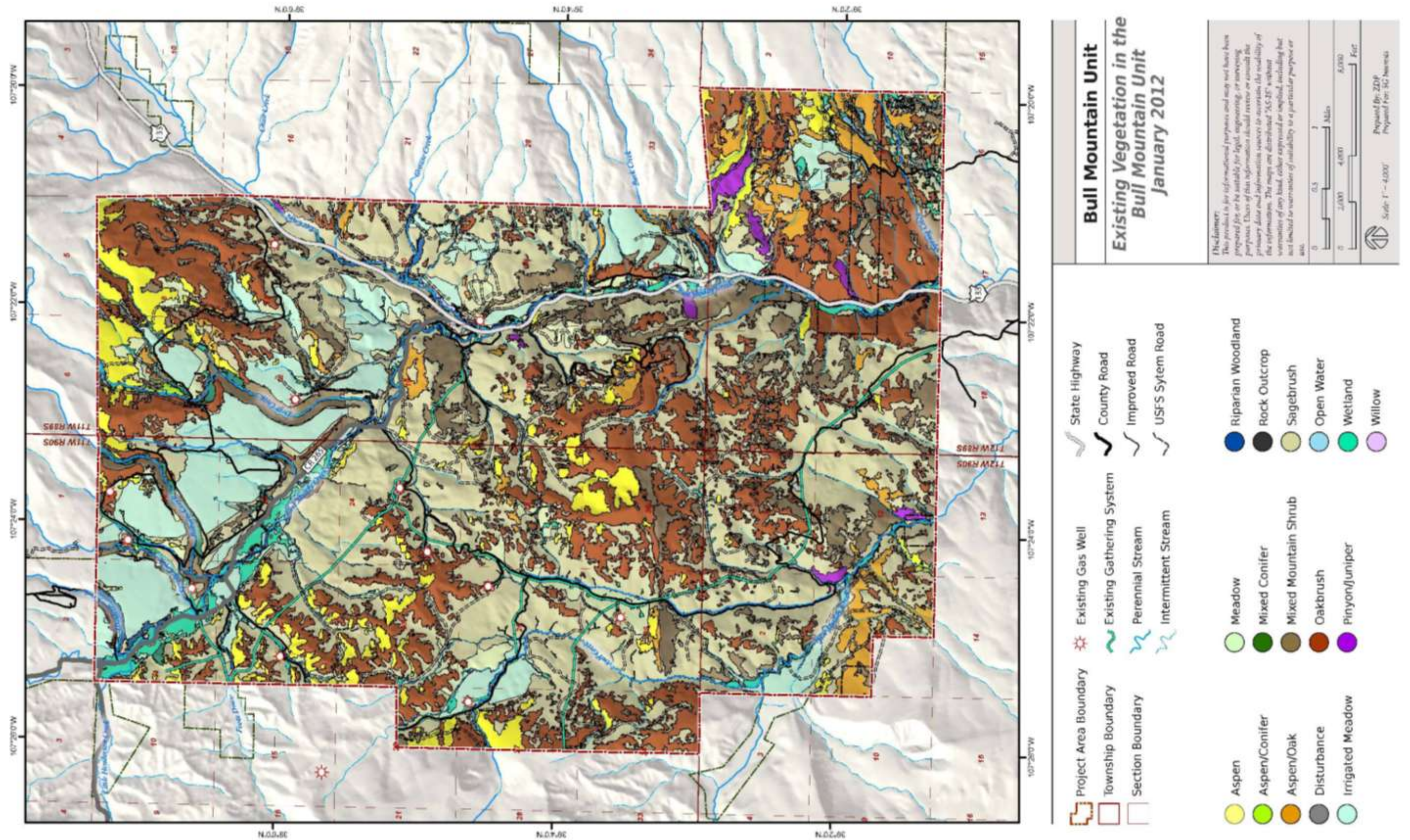


Figure 9. Existing Vegetation in the Bull Mountain Unit



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Common grasses include Indian ricegrass (*Achnatherum hymenoides*), bluebunch wheatgrass, slender wheatgrass, western wheatgrass (*Pascopyrum smithii*), bottlebrush squirreltail (*Elymus elymoides*), junegrass, and muttongrass (*Poa fendleriana*). Common forbs include tapertip onion (*Allium acuminatum*), running fleabane, lobeleaf groundsel (*Packera multilobata*), tailcup lupine, death camas (*Toxicoscordion venenosum*), coppermallow (*Sphaeralcea coccinea*), balsamroot (*Balsamorhiza sagittata*), and Indian paintbrush (*Castilleja* sp.).

**Pinyon/Juniper Woodland** – Stands of pinyon pine (*Pinus edulis*) and Utah juniper—generally consisting almost entirely of the latter—occur at lower elevations of the project area, often interspersed within sagebrush shrublands or drier types of mixed mountain shrubland. This habitat type is best developed at the southern end of the unit on south and west facing slopes. Associated shrubs include bitterbrush, Utah serviceberry, broom snakeweed (*Gutierrezia sarothrae*), and skunkbrush (three-leaf sumac) (*Rhus trilobata*). In general, the sparse herbaceous layer consists of graminoids such as cheatgrass (*Anisantha tectorum*), western wheatgrass, Indian ricegrass, bottlebrush squirreltail, muttongrass, and Sandberg bluegrass. Forbs are a minor component.

**Aspen Forest** – At the higher elevations in the Unit, and on north facing slopes at mid-elevations stands of quaking aspen occur. In the lower elevation aspen stands, understory vegetation is dominated by chokecherry and Saskatoon serviceberry. The understory in this system can also include low-growing shrubs such as common juniper (*Juniperus communis*), Woods’ rose (*Rosa woodsii*), and roundleaf snowberry as well as a diverse grass/forb understory. Perennial grasses in the herbaceous layer include the native mountain brome (*Bromopsis marginatus*) as well as the non-native smooth brome.

**Irrigated meadow** – A major community type in the Unit is irrigated hay meadows. These pasturelands occur mostly towards the northern end of the Unit. Dominant vegetation includes timothy (*Phleum pratense*), orchardgrass (*Dactylis glomerata*), red clover (*Trifolium pratense*), Kentucky bluegrass (*Poa pratensis*), and smooth brome (*Bromus inermis*). The noxious weed Canada thistle (*Cirsium arvense*) is common in wetter areas and in ditches. Some native wetland graminoids, including beaked sedge (*Carex utriculata*) and meadow sedge (*Carex praeegracilis*) occurred in the irrigation ditch laterals. Almost the entire irrigated meadow community is dominated by non-native vegetation.

**Environmental Consequences/Mitigation:** Table 18 details the impacts to vegetation communities under each Alternative.

**Table 18. Impacts to Vegetation Communities, All Alternatives**

Vegetation Type	Proposed Action				Alternative 1				No Action			
	Construction		Production		Construction		Production		Construction		Production	
	Acres	% <sup>1</sup>	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Aspen	11.7	.06%	3.5	.02%	10.1	.05%	3.4	.02%	1.8	.01%	0.3	.00%
Aspen/Conifer	0.0	.00%	0.0	.00%	0.0	0.0%	0.0	.00%	0.0	.00%	0.0	.00%
Aspen/Oak	3.7	.02%	0.9	.00%	10.4	.05%	3.5	.02%	1.7	.01%	0.7	.00%
Disturbed Area	1.0	.01%	24.1	.12%	0.8	.00%	25.3	.13%	3.3	.02%	41.5	.21%
Irrigated Meadow	16.5	.08%	5.4	.03%	22.8	.12%	7.7	.04%	34.6	.18%	7.5	.04%
Meadow	8.7	.04%	4.2	.02%	7.1	.04%	3.4	.01%	7.7	.04%	3.2	.02%
Mixed Conifer	0.0	.00%	0.0	.00%	0.0	.00%	0.0	.00%	0.2	.00%	0.0	.00%
Mixed Mountain Shrub	9.9	.05%	2.2	.01%	8.6	.04%	3.2	.02%	6.4	.03%	1.4	.01%
Oakbrush	36.1	.18%	9.7	.05%	31.5	.16%	8.5	.04%	1.9	.01%	0.5	.00%
Pinyon/Juniper	0.1	.00%	0.0	.00%	0.1	.00%	0.0	.00%	0.0	.00%	0.0	.00%
Riparian Woodland	0.2	.00%	0.1	.00%	0.3	.00%	0.1	.00%	0.0	.00%	0.0	.00%

**Table 18. Impacts to Vegetation Communities, All Alternatives**

Vegetation Type	Proposed Action				Alternative 1				No Action			
	Construction		Production		Construction		Production		Construction		Production	
	Acres	% <sup>1</sup>	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Rock Outcrop	0.0	.00%	0.0	.00%	0.0	.00%	0.0	.00%	0.0	.00%	0.0	.00%
Sagebrush	194.1	.99%	74.4	.38%	160.6	.82%	66.2	.34%	72.1	.37%	14.2	.07%
Wetland/Riparian Area	4.1	.02%	1.4	.01%	3.3	.02%	1.1	.01%	1.5	.01%	0.5	.00%
Willow	0.0	.00%	0.0	.00%	0.0	.00%	0.0	.00%	0.0	.00%	0.0	.00%
Open Water	0.3	.00%	0.0	.00%	0.1	.00%	0.0	.00%	0.1	.00%	0.0	.00%
<b>Total</b>	<b>286.4</b>	<b>1.46%</b>	<b>125.8</b>	<b>.64%</b>	<b>255.7</b>	<b>1.3%</b>	<b>121.2</b>	<b>.62%</b>	<b>131.2</b>	<b>.67%</b>	<b>69.8</b>	<b>.35%</b>

<sup>1</sup> Percentage of total Bull Mountain Unit

**Proposed Action** – Construction of the temporary and permanent features of the Proposed Action would impact vegetation communities as shown in Table 18.

The pipeline corridors (10.7 miles) would be reclaimed during the same growing season as construction, using one or more seed mixes approved by BLM (Appendix B), subject to discussion and approval by the surface landowner and BLM. BLM's seed mix menus provided to the operator that are appropriate for the project area consist entirely of native perennial grasses. Reclamation of disturbed areas along pipeline corridors and temporary disturbance sites around pads, cut-and-fill slopes, flowback pits, and topsoil piles would result in the conversion of existing shrub- or tree-dominated communities to grass-dominated communities. Over time, however, natural colonization of the reclaimed areas by forbs and woody plants from nearby undisturbed areas would be expected based on observed reclamation patterns in the Unit over the past 6 years. Because full natural colonization would require many years, periodic reopening of temporary disturbance areas (e.g., to replace or add new pipeline) would interrupt this process and restart the revegetation process. Use of more aggressive non-native graminoids or forbs in seed mixes prescribed by landowners or other agencies (e.g., CPW) would extend the period of time during which corridors are dominated by grasses and would retard the establishment of native forbs and shrubs.

With implementation of reclamation practices specified in Appendix B, including topsoil handling, seeding, mulching, and weed control, the establishment of desirable herbaceous vegetation on corridors and temporary disturbance areas sufficient to minimize wind or water erosion and invasion by weeds would occur within 2 to 5 years. In wetland areas, replanting of local native wetland species is required by the U.S. Army Corps of Engineers (USACE), per section 404 of the Clean Water Act.

Construction impacts to vegetation would comprise approximately 286.4 acres (1.46% of the Unit). Permanent disturbances (e.g., roads and pad surfaces) would result in conversion of 125.8 acres of existing vegetation communities (0.64% of the Unit) to a non-vegetated condition.

Deposition of dust from unpaved roads (36.4 miles) is another source of potential impacts to vegetation. Dust from roads can contain very fine particles (PM<sub>10</sub> and PM<sub>2.5</sub> that make up part of a dust cloud, described more completely in the Air Quality section).

Potential impacts to vegetation from dust deposits may include, but are not limited to:

- Reduced photosynthesis due to reduced light penetration through the leaf surface, which may cause stunting and/or reduced growth rates and plant vigor.
- Increased incidence of plant pests and disease. Dust deposits can act as a medium for the growth of fungal diseases.
- Reduced efficacy of herbicide sprays due to reduced penetration through the leaf surface.

- Potential contamination of native wildflowers and their blossoms, altering patterns of pollen dispersal (and thus gene flow) among plants by altering the foraging behavior of pollinating insects.

Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to vegetation resources and reduce generation of dust. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The cumulative impacts assessment area for vegetation includes the greater Bull Mountain Unit area and surrounding lands. Since 2002, redevelopment of historical well pads and construction of new well pads, roads, and pipelines by SG and Gunnison Energy Corporation have resulted in the direct loss of vegetation communities, as well as temporary impacts from the installation of pipelines and landowner-required vegetation management projects (such as sagebrush mowing).

Cumulative impacts would occur across the Unit from the reasonably foreseeable combined implementation of the No Action Alternative with the Proposed Action, as summarized in Table 19, and would result in production impacts to approximately 0.85% of the Unit's vegetation communities. When combined with existing natural gas impacts, the total long-term impact to vegetation communities in the Unit would still be less than 1%.

**Table 19. Cumulative Impacts to Vegetation, Proposed Action**

Vegetation Type	Proposed Action + No Action					
	Construction		Production		Existing	
	<i>Acres</i>	<i>%<sup>1</sup></i>	<i>Acres</i>	<i>%</i>	<i>Acres</i>	<i>%</i>
Aspen	13.52	.07%	3.7	.02%	0.0	.00%
Aspen/Conifer	0.0	.00%	0.0	.00%	0.0	.00%
Aspen/Oak	5.0	.03%	1.5	.01%	0.0	.00%
Disturbed Area	4.5	.02%	1.4	.01%	49.9	.25%
Irrigated Meadow	48.9	.25%	12.1	.06%	4.4	.02%
Meadow	16.0	.08%	12.1	.06%	3.8	.02%
Mixed Conifer	0.2	.00%	0.0	.00%	0.0	.00%
Mixed Mountain Shrub	15.1	.08%	5.4	.00%	0.0	.00%
Oakbrush	37.3	.19%	10.0	.05%	0.0	.00%
Pinyon/Juniper	0.1	.00%	0.0	.00%	0.0	.00%
Riparian Woodland	0.2	.00%	0.1	.00%	0.0	.00%
Rock Outcrop	0.0	.00%	0.0	.00%	0.0	.00%
Sagebrush	249.6	1.27%	84.0	.43%	3.8	.02%
Wetland/Riparian Area	5.3	.03%	1.9	.01%	0.3	.00%
Willow	0.0	.00%	0.0	.00%	0.0	.00%
Open Water	0.4	.00%	0.0	.00%	0.0	.00%
<b>Total</b>	<b>396.0</b>	<b>2.01%</b>	<b>168.1</b>	<b>0.85%</b>	<b>62.1</b>	<b>0.32%</b>

Other cumulative impacts to vegetation communities could occur from the reasonably foreseeable continuation of livestock grazing across much of the Unit. This grazing puts certain pressures on native grasses, forbs, and shrubs, and has likely shifted the dominance of certain species across the Unit. Additionally, some increased cover of noxious weeds has likely accompanied persistent grazing pressure. Another significant cumulative impact to vegetation communities is the likely long-term continuation of widespread irrigation of meadows for grass hay production. At this time irrigated meadows account for 10.1% of the Unit that would otherwise likely consist of sagebrush community types.

**Alternative 1** – Construction impacts to vegetation would comprise 255.8 acres (1.3% of the Unit), which would be approximately 31.1 acres less than the Proposed Action. Production disturbance (e.g., roads and pad surfaces) would result in conversion of 121.2 acres of existing vegetation communities (0.62% of the Unit) to a non-vegetated condition, a difference of less than 5 acres compared to the Proposed Action. The types of impacts would be the same as for the Proposed Action, although there would be fewer miles of pipeline (8.5 miles not co-located with roads) and fewer miles of roads (34.1 miles). Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to vegetation resources and reduce generation of dust. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The types of cumulative impacts to vegetation from the implementation of Alternative 1 in combination with the No Action Alternative would be the same as for the Proposed Action. Alternative 1 would have 3.3 fewer miles of new or improved access roads and 6 fewer miles of new pipelines than the Proposed Action; thus construction impacts would be proportionately reduced. However, production impacts following full reclamation of the pipeline corridor and interim reclamation of well pads would be similar to the Proposed Action at 0.85% of the Unit, as summarized in Table 20.

**Table 20. Cumulative Impacts to Vegetation, Alternative 1**

Vegetation Type	Alternative 1 + No Action					
	Construction		Production		Existing	
	Acres	%	Acres	%	Acres	%
Aspen	11.8	.06%	3.8	.02%	0.0	.00%
Aspen/Conifer	0.0	.00%	0.0	.00%	0.0	.00%
Aspen/Oak	11.8	.06%	4.1	.02%	0.0	.00%
Disturbed Area	4.0	.02%	45.3	.23%	49.9	.25%
Irrigated Meadow	55.0	.28%	15.2	.08%	4.4	.02%
Meadow	14.5	.07%	6.2	.03%	3.8	.02%
Mixed Conifer	0.2	.00%	0.0	.00%	0.0	.00%
Mixed Mountain Shrub	3.7	.07%	3.2	.02%	0.0	.00%
Oakbrush	32.7	.17%	8.9	.05%	0.0	.00%
Pinyon/Juniper	0.1	.00%	0.0	.00%	0.0	.00%
Riparian Woodland	0.3	.00%	0.1	.00%	0.0	.00%
Rock Outcrop	0.0	.00%	0.0	.00%	0.0	.00%
Sagebrush	220.8	1.12%	78.4	.40%	3.8	.02%
Wetland/Riparian Area	4.6	.02	1.6	.01%	0.3	.00%
Willow	0.0	.00%	0.0	.00%	0.0	.00%
Open Water	0.2	.00%	0.0	.00%	0.0	.00%
<b>Total</b>	<b>369.6</b>	<b>1.88%</b>	<b>166.8</b>	<b>0.85%</b>	<b>62.1</b>	<b>0.32%</b>

**No Action Alternative** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would develop up to 55 new wells on 11 well pads on fee surface and would add up to 11 wells to existing well pads. Construction impacts to vegetation would comprise 131.2 acres (.67% of the Unit), approximately 155.2 acres less than the Proposed Action. Production disturbances (e.g., roads and pad surfaces) would result in conversion of 69.8 acres (0.35% of the Unit) to a non-vegetated state, which is approximately 26.5 acres less than under the Proposed Action. The types of impacts would be the same as for the Proposed Action.



**Finding on the Public Land Health Standard for plant and animal communities** (partial; see also Wildlife, Aquatic; Wildlife, Terrestrial; and Invasive, Non-native Species): Based on the Land Health Assessment for the North Fork Landscape (BLM 2007), surface lands managed by the BLM have been identified as having some ongoing vegetation issues associated with the long-term use of the Spring Creek Trail as an existing (and historic) stock driveway that sees heavy cattle utilization, and is also an active OHV trail. Vegetation issues include low plant and litter cover, low cool-season grass cover, low forb cover, minor noxious weed infestations, and shrubs with poor vigor. These issues are associated with heavy and persistent cattle grazing pressure, trampling of vegetation, high concentrations of elk and mule deer winter browsing, and the continued use of the Spring Creek Trail which is a historic route that was not likely designed to handle OHV use and long-term and persistent disturbances associated cattle drives and heavy grazing pressure. The Proposed Action would see a pipeline route and new access road crossing BLM lands that has existing vegetation issues associated with the stock driveway. However, with proper implementation of proposed BMPs and reclamation, long-term plant community health and function would be maintained and the land health standard would continue to be met. Monitoring of additional natural gas development activities in areas with existing vegetation issues would be necessary, as cattle grazing pressure and trampling can be counter to reclamation efforts, and cause failure of revegetation and establishment of health plant communities. The Proposed Action, Alternative 1, and No Action would not jeopardize the viability of any plant population or plant community type and would have no significant consequences for habitat condition, utility, or function or discernible adverse effects on plant species abundance or distribution. Public land health standard 3 would continue to be met. Given the cumulative use of the landscape as livestock range, timely installation of livestock exclosures around sensitive wetland areas and monitoring of revegetation efforts and noxious weeds would be necessary to ensure that revegetation efforts are successful, particularly on steep slopes, in wetlands, and in livestock loafing areas.

#### **INVASIVE, NON-NATIVE SPECIES** (includes a finding on Standard 3)

**Affected Environment:** The Bull Mountain Unit occurs within a mixed mountain shrubland community type that has seen various agricultural uses and surface disturbances over the last 100+ years. Recently, natural gas exploration and development activities have also been creating surface disturbances. Musk thistle (*Carduus nutans*) is widely scattered across the Unit and becomes quite noticeable on private property at the southwestern side of the Unit. Scattered Japanese brome (*Bromus japonicus*) and houndstongue (*Cynoglossum officinale*) are also common. Canada thistle occurs in more mesic (moist) sites. Other weeds in the vicinity of the project area and potentially becoming problematic in areas of surface disturbance include a non-native annual cheatgrass and limited patches of the non-native biennial forbs spotted knapweed (*Centaurea stoebe ssp. micranthos*) and diffuse knapweed (*Centaurea diffusa*), which currently infests the CDOT yard at the junction of CR 265 and SH 133. Other weeds minimally occurring in the general area include oxeye daisy (*Chrysanthemum leucanthemum*), scentless chamomile (*Matricaria perforata*), whitetop (*Cardaria draba*), and yellow toadflax (*Linaria vulgaris*). Vegetative cover by noxious weeds in the general area is estimated at less than 1% of the total plant cover. For the past 8 years SG has annually treated noxious weeds on their pads, access roads, and pipeline corridors. Noxious weeds in these areas are relatively infrequent.

All of the weedy forbs listed above except cheatgrass are on the Colorado Department of Agriculture “List B” of noxious weeds in the state. These are defined as “weed species for which the Commissioner (in consultation with the state noxious weed advisory committee, local governments, and other interested parties) develops and implements state noxious weed management plans designed to stop their continued spread.” Cheatgrass is a “List C” species for which a state noxious weed management plan will be developed in the future.

## **Environmental Consequences/Mitigation:**

**Proposed Action** – The Proposed Action would create approximately 286.9 acres of construction disturbance and 125.9 acres of production disturbance. Surface-disturbing activities create conditions favorable for the invasion and establishment of noxious weeds and other invasive non-native species, particularly when these species are currently present in the surrounding area. Linear disturbance corridors from roads and pipelines (47.1 miles) can enhance the spread of invasive species.

Direct impacts to vegetation from weed infestations in the project area, if not treated, may reduce structural and native species diversity, result in the loss of wildlife habitat and rangeland productivity, and reduce the cover of desirable plant species.

Since musk thistle, Japanese brome, and Canada thistle are common in the immediate vicinity of the proposed pads and access roads, the potential for increased weed density and new weed invasions following construction disturbance would be high. It is very likely that weeds would be introduced into new areas where they were not previously found as a result of this Alternative. This threat would be reduced by mandatory noxious weed control (for A, B, and C listed species) which is required on pipeline corridors, well pads, and access roads for the life of the project in accordance with the Colorado Noxious Weed Act and the Gunnison River Watershed Integrated Weed Management Plan requirements.

Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts from invasive, non-native species. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The cumulative impacts assessment area for invasive species includes the greater Bull Mountain Unit area, as well as other nearby and relevant areas from which noxious weeds could be imported into the Unit, including the North Fork of the Gunnison River valley and the Roaring Fork valley. Within the Unit, it is reasonably foreseeable that the No Action Alternative would be implemented in conjunction with either the Proposed Action or Alternative 1. This would cumulatively add to impacts to vegetation communities which would increase the likelihood of noxious weed establishment. See the Vegetation section for a description of impacts to vegetation and thus habitat communities cumulatively impacted within the Unit.

In addition to added impacts within the Unit from implementation of the No Action Alternative, other disturbance would likely occur which could increase the risk of noxious weed establishment. Continued livestock grazing may place additional stressors on vegetation communities, which means that in some circumstances noxious weeds have more open ground to become established, or have less competition from adjacent native plant species. Widespread development of organic farms in the North Fork of the Gunnison River valley and recently in the Roaring Fork valley have created very favorable conditions for widespread noxious weed establishment, with limited treatment options. Non-chemical treatments are generally not as effective and noxious weed establishment and spread in these areas is cumulatively adding to seed sources for weeds. The presence of diffuse knapweed on CDOT's yard is a concern given the potential for widespread distribution of this weed with use of stockpiled gravels in the yard.

**Alternative 1** – Alternative 1 would create approximately 255.8 acres of construction disturbance and 121.4 acres of production disturbance, a reduction of approximately 31.1 construction and 4.5 production acres of disturbance as compared to the Proposed Action. Road and pipeline corridors would be 42.6 miles. The types of impacts and required mitigation and monitoring would be the same as for the Proposed Action. Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts from invasive, non-native species. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The types of cumulative impacts from invasive, non-native species resulting from the implementation of Alternative 1 in combination with the No Action Alternative would be the same as for the Proposed Action. However, Alternative 1 would have 3.3 fewer miles of new or improved access roads and 6 fewer miles of pipelines than the Proposed Action, which would proportionally reduce the opportunity for the spread of non-native, invasive species during construction.

**No Action Alternative** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would develop up to 55 new wells on 11 well pads on fee surface and would add up to 11 wells to existing well pads. This additional development would create 131.3 acres of construction disturbance and 80.3 acres of long-term disturbance, a reduction of approximately 155.6 construction and 45.6 production acres of disturbance as compared to the Proposed Action. Mandatory noxious weed control would be required on pipeline corridors, well pads, and access roads for the life of the project in accordance with the Colorado Noxious Weed Act and the Gunnison River Watershed Integrated Weed Management Plan requirements and federal requirements on existing federal authorizations.

**Finding on the Public Land Health Standard for plant and animal communities** (partial, see also Wildlife, Aquatic; Wildlife, Terrestrial; and Vegetation): Based on the Land Health Assessment for the North Fork Landscape (BLM 2007), surface lands managed by the BLM have been identified as having some ongoing weed issues associated with the long-term use of the Spring Creek Trail as an existing (and historic) stock driveway that sees heavy cattle utilization, and is also an active OHV trail. There are a number of small noxious weed infestations on these BLM lands, likely associated with heavy and persistent cattle grazing pressure and disturbances. The Proposed Action would see a pipeline route and new access road crossing BLM lands that have existing noxious weed issues associated with the stock driveway. Noxious weeds are also common, but in low densities throughout the Unit. Providing mandatory weed management requirements are followed, including the continued treatment of weed species, the Proposed Action, Alternative 1, and No Action would not jeopardize the viability of any plant population, or substantially degrade the natural community as a result of the proliferation of non-native, invasive species. The project would have minor consequence on habitat condition, utility, or function, but would not have any discernible effect on species abundance or distribution at any landscape scale. Monitoring and effective compliance with equipment washing, decontamination efforts, and documentation of those preventative activities would be necessary to ensure that invasive plant and animal species are not accidentally introduced. The public land health standard would continue to be met.

#### **THREATENED, ENDANGERED, AND SENSITIVE SPECIES** (includes a finding on Standard 4)

This section is divided into two discussions: Federally listed, proposed, or candidate threatened or endangered species (as listed under the Endangered Species Act), and BLM sensitive species. The analysis of the impacts addresses the geographic location and habitat characteristics of the project relative to species potentially present in the project vicinity. See the Biological Evaluation detailing wildlife use patterns in the area of the Bull Mountain Unit (Pettersen 2012).

**Affected Environment:** Listed or candidate wildlife, fish and plant species that were considered and evaluated for this assessment include those identified by the UFO and the U.S. Fish and Wildlife Service (USFWS) as potentially occurring in Gunnison County (accessed December 2011). While all species were considered, only species which occur in the area, have suitable habitat, or for which the Bull Mountain Unit is within the range of the species were selected for additional evaluation due to direct, indirect, and/or cumulative impacts. See the Biological Evaluation (Pettersen 2012) for the full list of species considered and evaluated.

The following habitats dominate the project area: 1) sagebrush, 2) mixed shrublands, 3) oakbrush, 4) riparian/emergent wetlands, 5) aspen, 6) irrigated hay meadows, and 7) upland grass meadows.

Information on species status, distribution, and ecology was derived from USFWS recovery plans, Colorado Natural Heritage Program database maps and reports, CPW habitat mapping (CPW 2011), personal knowledge of the author and reviewing BLM biologists, various scientific studies and reports, and correspondence with USFWS biologists.

Habitat surveys were conducted in the fall of 2007 through spring of 2011.

### *Federally Listed, Proposed, or Candidate Threatened or Endangered Plant Species*

Habitat necessary for life requirements of federally listed, proposed, or candidate threatened or endangered plant species are not found within the Unit.

### *BLM Sensitive Plant Species*

During field surveys for special status plant species, no sensitive plants species were observed, nor was suitable habitat present in the project area for any of these species.

### *Federally Listed, Proposed, or Candidate Threatened or Endangered Animal Species*

Canada Lynx (*Lynx canadensis*): Federally Threatened Species – In Colorado, Canada lynx occupy high-elevation coniferous forests characterized by cold, snowy winters and an adequate prey base (Ruggiero et al. 1999). The preferred prey of Canada lynx throughout their range is the snowshoe hare (*Lepus americanus*). In the western United States, lynx are associated with mesic forests of lodgepole pine, subalpine fir, Engelmann spruce, and quaking aspen in the upper montane and subalpine zones, generally between 8,000 and 12,000 feet in elevation. Although snowshoe hares are the preferred prey, lynx also feed on other species such as pine squirrel (*Tamiasciurus hudsonicus*), and blue (dusky) grouse (*Dendragapus obscurus*).

The Canada Lynx Conservation Assessment and Strategy (LCAS, Ruediger et al. 2000, revised 2003) was developed to provide a consistent and effective approach to conserve Canada lynx on federal lands in the conterminous United States. The LCAS indicates that project planning should evaluate the effects to lynx habitat within designated Lynx Analysis Units (LAU) that are generally  $\geq 25,000$  acres in the southern Rocky Mountain Geographic Area. LAUs do not represent actual lynx home ranges, but their scale should approximate the size of an area used by an individual lynx. A major transportation route to the Bull Mountain Unit is SH 133, which passes through the Ragged Mountain LAU (RMLAU) and McClure Pass Lynx Linkage Area (MPLLA). As such, the USFWS (K. Broderdorp, USFWS, pers. comm. 2011) has requested that indirect effects from development of the Bull Mountain Unit be investigated for potential effects to Canada lynx.

The RMLAU comprises 20,174.5 acres or 31.5 square miles (USFS 2008). Mapped lynx habitat in LAU statistics only includes lands in federal ownership. Environmental baseline statistics of lynx habitat in the RMLAU are summarized in Table 21 and Crystal West LAU in Table 22 (after guidance in the Southern Rockies Lynx Amendment [USFS 2008]).

**Table 21. Existing Habitats within the Ragged Mountain LAU**

Habitat Type	Acres	%
Primary Suitable	8,638.1	43%
Secondary Suitable	3,166.4	16%
Unclassified	8,370.0	41%
<b>Total</b>	<b>20,174.5</b>	<b>100%</b>

The RMLAU overlaps a small portion of the 27,034 acre MPLLA at the northern end of the LAU, linking the Huntsman Ridge area with habitats in the Crystal West, Crystal East, and Huntsman Mountain LAUs on the White River and GMUG National Forests. The McClure Pass LLA links suitable lynx habitats in the Elk Mountains to potential habitats on Huntsman Ridge and the Grand Mesa. SH 133 is within the McClure Pass Lynx Linkage Area.

The Crystal West LAU is a relatively large LAU at 97,535 acres, and is located on the White River National Forest. At this time the WRNF still utilizes habitat definitions previously described under the LCAS. The LCAS provides guidelines for the management of lynx habitat within LAUs, and recommends that at least 10% of an LAU be suitable Denning habitat, and the CWLAU is at 15%

Denning habitat. The LCAS also recommends that at least 6,500 acres of primary lynx habitat (Denning and Winter Foraging habitats) be available for lynx use; the CWLAU is at 35,392 acres.

**Table 22. Existing Habitats within the Crystal West LAU**

Habitat Type	Acres	%
Winter Foraging	20,789.8	21%
Denning	14,602.8	15%
Other	10,884.3	11%
Non-Habitat	40,294.3	41%
Private	10,963.2	11%
<b>Total</b>	<b>97,534.4</b>	<b>100%</b>

Major existing land uses that may influence lynx habitat use within the Ragged Mountain LAU and McClure Pass LLA is generally limited to widespread livestock grazing, dispersed camping and infrequent trail use, relatively active fall big game hunting, and some limited winter-time snowmobile activities.

Colorado River Endangered Fish: Federally Endangered Species – The USFWS lists the humpback chub (*Gila cypha*), bonytail chub (*G. elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), and razorback sucker (*Xyrauchen texanus*) as occurring in downstream waters in the Colorado River, and the Colorado pikeminnow and razorback sucker also occur in lower reaches of the Gunnison River, near the City of Delta down to the confluence with the Colorado River.

The Bull Mountain Unit is approximately 60 river miles upstream of the nearest designated critical habitat for the Colorado pikeminnow and razorback sucker and even further away for designated critical habitats for the humpback chub and bonytail in the mainstem of the Colorado River.

Greenback cutthroat trout (*Onchorhynchus clarkii stomias*): Federally Threatened Species – Genetic testing through the AFLP process has determined that populations of cutthroat trout in Roberts Creek and Dyke Creek (both creeks are tributaries in the Muddy Creek basin) are not Colorado River cutthroat trout (*Onchorhynchus clarkii pleuriticus*) lineages (CR lineage), but are actually greenback cutthroat trout lineages (C. Speas USFS pers. comm. 1/26/2010, D. Kowalski CPW 2010). The Roberts Creek population is 96% genetically pure greenback cutthroat trout and the Dyke Creek population is 98% genetically pure. Any population that shows at least 80% genetic purity would be subject to the requirements of the Endangered Species Act (C. Speas pers. comm. 1/26/2010, USFWS 2010). Fish sampling in Ault Creek revealed that there are no cutthroat trout within that creek (Pettersen 2012). Cutthroat trout populations in Henderson Creek have not undergone the AFLP genetic testing process, but mitochondrial DNA testing has shown those trout to have greenback cutthroat trout lineage. Greenback cutthroat trout occur in clear, cold, high-gradient streams and creeks. They are extremely vulnerable to competition by non-native trout (e.g., brook trout [*Salvelinus fontinalis*]), which were accidentally released in the Clear Fork. Trout are also vulnerable to water depletions.

#### *BLM Sensitive Species*

Of the 31 UFO listed sensitive animal species known or likely to occur in or adjacent to the Bull Mountain Unit, most do not occur in the area- at least not on a regular basis, and most are listed as “unlikely” based on project location and habitat types. However, eight species are considered as “possibly” occurring, indicating a greater likelihood of occurrence, or “present,” in that they are known to occur. These species are addressed below.

Northern Goshawk (*Accipiter gentilis*) – This raptor nests in subalpine spruce/fir, Ponderosa pine, aspen forests, and infrequently in mature pinyon/juniper woodlands, but may move to lower-elevation

woodlands during winter in search of prey. The Unit provides suitable nesting and foraging habitat for this species.

Bald Eagle (*Haliaeetus leucocephalus*) – Removed from the federal list of threatened or endangered species in August 2007, this large raptor is now considered a sensitive species and remains protected by the Bald and Golden Eagle Protection Act (BGEPA) as well as the Migratory Bird Treaty Act. Bald eagles roost during the winter months along Muddy Creek at the southern end of the Unit, but may scavenge on winter-killed big game species in upland areas in the Unit. Bald eagles are not known to occur in the area during the summer months.

Brewer's Sparrow (*Spizella breweri*) – This migrant is essentially a sagebrush obligate, although it may occasionally nest in other semi-desert shrublands. Sagebrush is a significant component of the habitat in the Unit, and this species is known to nest in the project area (Pettersen 2012). This species does not occur in the area during the winter months (see the Migratory Birds Section).

Bat Species – Bats potentially found in the Unit include Townsend's big-eared bat (*Corynorhinus townsendii pallescens*), spotted bat (*Euderma maculatum*), and fringed myotis (*Myotis thysanodes*). All of these bat species may forage over shrublands typified by the sagebrush and pinyon-juniper woodlands occurring within the lower elevations and south-facing slopes in the Unit. However, these bat species require nearby rock outcrops, caves or mines (abandoned or active) for shelter; for fringed myotis and spotted bat, old buildings and larger trees with cavities will suffice. Rock outcrops occur at the southern end of the Unit, near the West Muddy Creek and East Muddy Creek canyons, but no direct or indirect impacts to these outcrops would occur.

Leopard Frog (*Lithobates pipiens*) – This species occurs in the Unit in irrigated meadows, riparian areas and creeks, and prefers sunny, grassy wetlands. It requires abundant aquatic vegetation for breeding and adjacent semi-aquatic vegetation for cover when adults disperse short distances to feed. Leopard frogs feed primarily on emergent adults of aquatic insects or on terrestrial insects attracted to the water.

#### **Environmental Consequences/Mitigation:**

##### **Proposed Action –**

##### *Federally Listed, Proposed, or Candidate Animal Species*

Canada Lynx – The Proposed Action would have no direct or indirect impact to suitable lynx habitat, but the Proposed Action would result in increased traffic over McClure Pass through a Lynx Linkage Area. The additional 160 vehicle trips per day generated during construction of roads and pipelines, and 108 trips per day during drilling and construction of pipelines for the Proposed Action would mostly occur during the summer, would be mostly during the daylight hours, and would not increase traffic beyond the 2,000 vehicles per day threshold. Based on information provided by SG, only 25% of all vehicle trips or approximately 40 vehicle trips per day would be anticipated to be traveling through the McClure Pass linkage area during the development of this project. While a 3% increase in vehicle traffic traveling State Highway (SH) 133 does increase potential for vehicle collision with lynx potentially crossing the highway, the project is not anticipated to cause an increase above the 2,000-vehicle-per-day threshold at which it is believed that lynx are impeded from moving across the highway. Lynx should therefore still be able to cross SH 133 unimpeded (Pettersen 2012). The lynx's ability to disperse through the McClure Pass Lynx Linkage Area would be maintained and habitat fragmentation would not be created by the anticipated increased traffic. Lynx habitat in the greater McClure Pass area is generally unsuitable or marginal, and it is relatively unlikely that lynx would establish a home range there. Given these poor habitat conditions, impacts to lynx are likely discountable. While the indirect effects associated with the proposed action or alternative 1 are likely discountable none the less they are present therefore a determination of “*may affect, and is not likely to adversely affect*” is warranted for the Proposed Action.



Endangered Colorado & Gunnison River Fishes – Given SG’s use of BMPs for construction and maintenance, it is highly unlikely that the Proposed Action would have direct negative impacts to the four endangered Colorado River fish species due to water quality impacts. However, some isolated events may occur which release sediments. Such events would have no effect on the listed fish due to the presence of Paonia Reservoir, which would likely capture any released sediment loads. The distance and diluting abilities of Muddy Creek, Paonia Reservoir and the North Fork of the Gunnison River to occupied or critical habitats would mean that there would be no impact to these species from sediments or reasonably foreseeable contaminant (chemical) spills.

Water depletions are a potential source of impacts to fish. The types of water depletions considered in this EA are summarized in Table 23 and include:

- Water used for access road dust abatement
- Water used for road and pad construction (for moistening of aggregate for compaction)
- Water used to drill and complete wells (lubrication, circulation and cementing)
- Water for hydraulic fracturing
- Water used for connected actions (construction of a pipeline, road, or utility line)

**Table 23. Total Water Use under the Proposed Action**

<b>Type of Water Use</b>	<b>Acre-feet per well</b>	<b>Acre-feet, 146 wells</b>
Construction, roads	NA	62.90
Pipelines	NA	0.53
Construction, pads	NA	116.00
Drilling & cementing	0.32	48.33
Hydraulic fracturing recycled water	16.24	2,371.10
Hydraulic fracturing fresh water	6.96	1,016.21
<b>Total all fluids</b>	<b>23.52</b>	<b>3,615.07</b>
<b>Total fresh water</b>	<b>7.28</b>	<b>1,064.54</b>

Notes: Hydraulic fracturing based on 6 treatments/well, 22.1 miles of pipelines, and 12.2 miles of new roads

As the Unit would be developed over 6 years, the total fresh water acre-feet (ac-ft) depletions would be roughly spread out during this time period, resulting in fresh water annual consumptive depletions of 177.6 ac-ft for the Proposed Action. If development of the Unit were to take longer than 6 years, then the annual water depletion amount would decrease accordingly. Based on data from the USGS gauging station (#09130500), the mean annual discharge rate of East Muddy Creek near Bardine (1935-1953) varied from a low of 54.0 cfs (39,066 ac-ft per year) in 1940 to a high of 135.0 cfs (97,504 ac-ft per year) in 1938 (see the hydrology assessment for the Unit Master Development Plan [Berry 2011]). Therefore, if this water were removed directly from East Muddy Creek, maximum water depletion from the Proposed Action and Alternative 1 for East Muddy Creek ranges from about 0.5% of the average annual discharge during a dry year to 0.2% of the discharge during a wet year. SG has secured previously appropriated water for this project; as such, no “new” water would be depleted from the Muddy Creek system as a result of the construction and drilling phase of this project.

Net water depletions are actually expected to be lower given SG’s water augmentation plan (Berry 2011). However, the USFWS considers any net water depletion which could decrease instream flows to have direct and/or indirect impact to the four Colorado River endangered fish species. Therefore the Proposed Action **“may affect, and is likely to adversely affect”** the Colorado pikeminnow, razorback sucker, humpback chub, and bonytail chub. In May 2008, the BLM prepared a Programmatic Biological Assessment (PBA) that addresses water-depleting activities associated with the BLM’s fluid minerals program in the Colorado River Basin in Colorado. In response to the BLM’s PBA, the FWS issued a Programmatic Biological Opinion (PBO) (ES/GJ-6-CO-08-F-0006) on December 19, 2008, which determined that BLM water depletions from the Colorado River Basin are not likely to jeopardize the

continued existence of the Colorado pikeminnow, humpback chub, bonytail, or razorback sucker, and that BLM water depletions are not likely to destroy or adversely modify designated critical habitat.

A Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin was initiated in January 1988. The Recovery Program serves as the reasonable and prudent alternative to avoid jeopardy and provide recovery to the endangered fishes by depletions from the Colorado River Basin. The PBO addresses water depletions associated with fluid minerals development on BLM lands, including water used for well drilling, hydrostatic testing of pipelines, and dust abatement on roads. The PBO includes reasonable and prudent alternatives developed by the FWS which allow BLM to authorize oil and gas wells that result in water depletion while avoiding the likelihood of jeopardy to the endangered fishes and avoiding destruction or adverse modification of their critical habitat. As a reasonable and prudent alternative in the PBO, FWS authorized BLM to solicit a one-time contribution to the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (Recovery Program) in the amount equal to the average annual acre-feet depleted by fluid minerals activities on BLM lands.

This project has been entered into the Uncompahgre Field Office fluid minerals water depletion log which will be submitted to the Colorado State Office at the end of each fiscal year.

SG is already a signatory to the Endangered Fish Recovery Agreement (USFWS 1999), which is considered to be appropriate compensatory mitigation for likely foreseeable impacts, and because of this as well as possible USFWS-coordinated timed releases from augmenting water sources for the maintenance of instream flows (e.g., additional waters released from the Aspinall Unit), the impacts of additional water depletions could be mitigated by SG and the BLM, which would therefore make their activities compliant with the 1999 Programmatic BO and Recovery Agreement and ensure continued recovery of these listed fish species.

Greenback Cutthroat Trout – There would be no activities within the Henderson, Roberts, or Spring Creek drainages. Water depletions from the Ault Creek drainage and from Bainard Reservoir would have no impact on known greenback cutthroat trout lineage (GB lineage) fish or known occupied habitats.

The construction and operation of the features in the Proposed Action, including new roads, pipelines, pads, and associated water depletions would have “*no effect*” to greenback cutthroat trout given the use of Best Management Practices and applicant-committed mitigation. The Proposed Action would not impact conservation population levels or fish densities in nearby tributaries to East Muddy Creek.

#### *BLM Sensitive Species*

Northern Goshawk – Proposed development activities would have periods which involve loud noises with high levels of activity, but generally lasting for a few months during the spring, summer, and fall in any given area. The Proposed Action would have short-term development impacts directly impacting 13.3 acres, and permanently impact 3.7 acres of aspen and aspen/oak habitats, but would not impact mixed conifer habitats. Another 185.2 acres would have short-term indirect impacts through noise, human activities, and pipeline construction in suitable goshawk habitats. Approximately 136.6 acres around pads and access roads and other suitable goshawk habitats would have long-term, lower-intensity indirect impacts, which would likely keep goshawk from nesting within this area, and may also diminish habitat effectiveness for foraging, but would not entirely preclude use in these areas.

The habitats directly and indirectly impacted are relatively poor quality for goshawk nesting, and moderate quality for foraging. With suitable prey-bases and widespread forested habitat types beyond the Unit area, goshawk could still likely forage within the Unit. Outside of the summer reproduction and nesting season, northern goshawk could still encounter low levels of human activity during the winter months, which would have negligible impacts to goshawk given the small footprint of activities proposed and widespread foraging habitats available during the winter.

The Proposed Action “*may adversely impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range-wide,*” but nesting raptor surveys should occur to identify potential nesting activities.

Bald Eagle – Under the Proposed Action, the short-term construction phase would see approximately 69.7 acres of surface impacts within CPW mapped bald eagle winter ranges, or approximately 2.3% of available mapped winter ranges within the Unit. Long-term, there would be approximately 27.6 acres of surface impacts (0.9% of available mapped habitats). One pipeline would cross East Muddy Creek within winter ranges. The actual construction, drilling, and development of these facilities would likely occur during the summer months, well outside of the time period when bald eagles would be in the area. Therefore, no impact to wintering bald eagles would likely occur due to construction activities. Aside from one pipeline crossing, these activities would occur well away from large cottonwoods and suitable roost trees near East Muddy Creek. The pipeline crossing, if it is open-trenched and not bored, would likely be completed during the low-flow period of early winter, and it is possible that roosting bald eagles in the area would be disturbed and vacate the area during construction. Boring operations could occur during higher flow periods in the summer months. The main impact of development to bald eagles under the Proposed Action could result from a re-distribution of wintering elk and deer in the area and therefore potential scavenging opportunities for eagles. While this may indeed occur near pads and roads, deer and elk would still likely be in the general area, perhaps even closer to East Muddy Creek. The high mobility of bald eagles would still allow them to easily find and feed on any carrion in the general area, and no reduction in winter foraging habitat would be expected.

Because of the potential disturbance to roosting bald eagles during construction of the pipeline crossing of East Muddy Creek (for about 5 days if the creek is crossed during the winter months), and no other likely or foreseeable impacts, the Proposed Action “*may adversely impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range-wide.*”

Brewer’s Sparrow – The Proposed Action would create short-term construction related impacts to 138 acres (0.7% of available habitats in the Unit) and direct long-term production impact to 71.4 acres of sagebrush habitats. It is assumed that over 10 years or so, most of the cleared pipeline corridors and other temporary-use areas in sagebrush-dominated habitats would begin to support smaller sagebrush plants. However, in some circumstances where landowners choose to plant non-native grasses and forbs, the recovery of sagebrush plants in these temporarily disturbed acres may take much longer due to competitive exclusion of sagebrush.

Most construction activities would occur during the snow-free months when sparrows are in various stages of reproduction. Adult sparrows would easily be able to avoid any clearing of sagebrush plants, and therefore there would be no anticipated direct impacts to adult birds (i.e., mortality). However, sagebrush-clearing activities occurring during the nesting period (late May through early July) may result in the take of nests (i.e., eggs or nestlings).

Indirect impacts to Brewer’s sparrow would result from avoidance of nesting in sagebrush habitats near the access roads, construction areas, and active drilling sites during the construction process; however, they may still forage near roads and other active areas. The Proposed Action “*may adversely impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range-wide.*”

Bat Species – The Unit provides suitable foraging habitat for the listed sensitive bat species, and while there would be some loss of foraging habitat, the project’s impact to potential foraging areas would be very minor given the range of these species and their preference for lower elevation habitats. As bats require free water on a daily basis, any un-netted cuttings pits, flowback pits, or other available fluid storage areas would likely be used by bats for drinking. If these pits contain substances toxic to bats and

are not netted during the summer months (when bats are active), it is highly likely that bats would drink from these fluid storage areas, resulting in likely adverse effects. The Proposed Action would likely result in *no adverse impacts to these species, and would not result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range-wide.*

**Northern Leopard Frog** – The Proposed Action would have two pad sites and associated facilities located within irrigated pastures, and would also result in direct construction related impacts to 15.6 acres of wetlands and irrigated pastureland habitats (0.1% of available habitats in the Unit). Long-term production impacts would occur on 6.5 acres of potential frog habitats. The potential take of individual frogs could result from trampling or direct mortality during summer construction and development periods, as well as from substances hazardous to aquatic resources and frogs washing off of pad sites or roads and into suitable aquatic habitats. Some temporary diminished habitat effectiveness would occur in wetlands crossed by pipeline corridors. Stormwater sedimentation from roads would result in indirect impacts to wetlands and frog habitat. Water depletions from area ponds and reservoirs would also occur during construction and well development/completion periods, possibly impacting eggs, larvae, and foraging habitats for adults. As northern leopard frogs are hibernating during the winter months, wintertime activities on roads and pads would have no impact. The Proposed Action *“may adversely impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range-wide.”*

Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to Threatened, Endangered, and Candidate species. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The cumulative impacts assessment area for special status species includes the greater areas of influence for the species in question. For most species this would be the greater Bull Mountain Unit area and surrounding lands, but for more wide-ranging species, such as lynx, the cumulative impacts assessment area would include suitable habitats within the greater West Elk Mountains and the Grand Mesa. For Colorado River fish species, the cumulative impacts assessment area includes the upper Colorado and Gunnison River basins. Cumulative impacts to special status species would result from SG’s continued operation of federal and fee/fee wells and likely development of fee/fee wells as described under the No Action Alternative, in conjunction with the Proposed Action. Other cumulative impacts to wildlife species would result from development of other leases within the greater Muddy Creek basin. However, the mere existence of natural gas leases in the basin does not mean that they would all be developed. Nevertheless, SG and Gunnison Energy are pursuing the development of other leases within the area (see the Cumulative Impacts section for a description of these projects).

Other cumulative impacts would come from the widespread agricultural operations, particularly from cattle and sheep grazing, water diversion projects for irrigation waters, and the widespread conversion of sagebrush shrublands to irrigated hay fields. These impacts have reduced habitats and indirectly reduced habitat effectiveness for many species, and have dramatically reduced instream water levels for fish species. Livestock grazing reduces native plant cover and diversity, and can have negative impacts to riparian systems if not managed correctly. Recently, development of organic farms has increased the presence of noxious weeds in many agricultural areas, which have the potential of spreading into native habitats. More extensive trails systems and higher use levels of trails by mountain bikers, hikers, and OHVs introduces more regular human disturbances, noise, and a loss of habitat effectiveness around trails. In some very popular trail areas, diurnal wildlife use can be significantly reduced because of trail use patterns. While hunting of big game species is an impact, the numbers of hunters and timing of hunting seasons has remained relatively stable.

The widespread OHV use associated with hunting is a relatively recent occurrence that has introduced a new type of impact, and has likely changed hunter densities in some areas, and reduced hunter densities in other areas. Area coal mines and associated ancillary facilities has had localized, but intensive impacts to habitats. Indirect impacts from coal mines have included increased traffic, noise and fugitive lighting, which can have direct and indirect negative impact to wildlife and their habitats.

Table 24 presents the modeled indirect impact areas under the Proposed Action with the reasonably foreseeable implementation of the No Action Alternative. Please refer to the BE for a description of the GIS-based indirect impact modeling procedure utilized (Pettersen 2012).

**Table 24. Cumulative Modeled Impact to Habitats, Proposed Action + No Action**

Vegetation Type	Existing Conditions		Construction Impacts		Production Impacts	
	<i>Acres</i>	<i>%<sup>1</sup></i>	<i>Acres</i>	<i>%</i>	<i>Acres</i>	<i>%</i>
Aspen	1,123.9	5.7%	159.9	14.2%	131.5	11.7%
Aspen/Conifer	12.3	0.1%	0.0	0.0%	0.0	0.0%
Aspen/Oak	768.8	3.9%	57.6	7.5%	57.8	7.5%
Disturbed Area	174.7	0.9%	44.7	25.6%	93.4	53.4%
Irrigated Meadow	1,981.0	10.1%	619.5	31.3%	521.1	26.3%
Meadow	552.6	2.8%	208.0	37.6%	260.8	47.2%
Mixed Conifer	62.5	0.3%	4.7	7.5%	2.1	3.3%
Mixed Mountain Shrub	1,753.5	8.9%	189.6	10.8%	134.1	7.7%
Oakbrush	3,991.5	20.3%	562.5	14.1%	463.5	11.6%
Pinyon/Juniper	129.3	0.7%	3.0	2.3%	0.0	0.0%
Riparian Woodland	87.3	0.4%	11.7	13.4%	13.2	15.1%
Rock Outcrop	1.5	0.0%	0.0	0.0%	0.0	0.0%
Sagebrush	8,257.4	42.0%	2,448.1	29.6%	2,573.8	31.2%
Wetland/Riparian Area	671.8	3.4%	122.3	18.2%	154.9	23.1%
Willow	16.1	0.1%	2.1	13.2%	3.5	22.0%
Open Water	88.8	0.5%	11.8	13.2%	14.2	15.9%
<b>Total</b>	<b>19,673.0</b>	<b>100.0%</b>	<b>4,445.5</b>	<b>22.6%</b>	<b>4,423.9</b>	<b>22.5%</b>

Cumulative impacts would result in additional direct surface impacts as well as increased indirect impacts to wildlife, wildlife habitats, and species ability to utilize otherwise available habitats which are adjacent to roads, pad sites, flowback pits, and to a lesser extent pipeline construction corridors. Under the Proposed Action, total modeled indirect impacts to area habitats would be approximately 34.5% of the Unit, and under Alternative 1, modeled indirect impacts totaled 31.3% of the Unit area. Other cumulative impacts to species and their habitats within the greater Muddy Creek area include cattle and sheep grazing on private lands within the Unit, and on public lands outside of the Unit. With sheep grazing the use of guard dogs is needed to reduce coyote and bear predation, but this can have additional ancillary impacts to other species such as deer, elk, rabbits and hares, other small mammals, and ground-nesting birds. Livestock grazing reduces upland foliar cover and can have significant impacts to riparian and wetland areas through hoof action, reductions in wetland foliar cover, loss of wetland and riparian habitats (through root damage and bank cutting), increased water temperatures and increased silt deposition to aquatic environments. Livestock manure decreases water quality. Irrigation for hay and agricultural crop production reduces instream water levels, decreases water quality, increases water temperatures, and reduces the cover of native wildlife habitats.

Treatment of noxious weeds is common inside and outside of the Unit, and while the benefits of keeping noxious weed cover down dramatically outweigh the deleterious impacts to non-target species, some reductions in native forbs would be likely.

Local ranches within and adjacent to the Unit also commonly use widespread application of herbicides to kill shrubby species, including sagebrush, snowberry, rabbitbrush, Gambel's oak, Utah serviceberry, and chokecherry to increase foraging potential for livestock. This can reduce foliar cover of important wildlife forage species, and reduce nesting habitats and refugia for wildlife.

Ranches within the Unit have used mowing to reduce the foliar cover of sagebrush in order to increase foraging potential for livestock. This too can have deleterious impacts to shrubby species and wildlife species that forage and seek shelter in sagebrush communities.

Increased traffic on SH 133 and CR 265 from recreationists, travelers, and from other natural gas development activities can also have negative impacts to wildlife habitat connectivity, dispersal of wildlife species, and utilization of adjacent habitats. Direct mortality from vehicle strikes also occurs, especially during the winter months when big game species congregate at lower elevations near SH 133.

**Alternative 1** – Alternative 1 would have the same types of impacts to individual species, and the same overall determination of impacts as the Proposed Action. Potential changes to the level of impact are described by species.

*Federally Listed, Proposed, or Candidate Animal Species*

Canada Lynx – Alternative 1 would result in an additional 160 vehicle trips per day during road and well pad construction, and 108 vehicle trips per day during drilling and pipeline construction, the same as the Proposed Action; however, as discussed for the Proposed Action, it is relatively unlikely that a lynx would be struck by a vehicle given the poor lynx habitat in the greater area.

Endangered Colorado & Gunnison River Fishes – Alternative 1 would result in annual fresh-water depletions of approximately 177.6 ac-ft (equal to the Proposed Action), and are summarized in Table 25. Net water depletions are expected to be much lower given SG's water augmentation plan.

**Table 25. Total Water Use under Alternative 1**

Type of Water Use	Acre-feet per well	Acre-feet, 146 wells
Construction, roads	NA	56.71
Pipelines	NA	0.38
Construction, pads	NA	116.00
Drilling and cementing	0.32	48.33
Hydraulic fracturing recycled water	16.24	2,371.10
Hydraulic fracturing fresh water	6.96	1,016.21
<b>Total all fluids</b>	<b>23.52</b>	<b>3,608.75</b>
<b>Total fresh water</b>	<b>7.28</b>	<b>1,064.54</b>

Notes: Hydraulic fracturing based on 6 treatments/well for 146 wells, 16.1 miles of pipelines, and 11.0 miles of new roads.

Greenback Cutthroat Trout – There would be no activities within the Henderson, Roberts, or Spring Creek drainages. Water depletions from the Ault Creek drainage and from Bainard Reservoir would have no impact on known greenback cutthroat trout lineage fish or known occupied habitats.

The construction and operation of the features in Alternative 1, including new roads, pipelines, pads, and associated water depletions would have “*no effect*” to greenback cutthroat trout given the use of Best Management Practices and applicant-committed mitigation. Alternative 1 would not impact conservation population levels or fish densities in nearby tributaries to East Muddy Creek.

*BLM Sensitive Species*

Northern Goshawk – Alternative 1 has only one proposed pad site within marginally suitable goshawk habitat, the ALT 12-89-4 #2, and two pads in even more marginal habitats, the ALT 12-89-9 #1 and the



ALT 11-89-8 #1. The development of the one pad within and two pads as well as associated infrastructure in close proximity to goshawk habitats (aspen, aspen/conifer, and aspen/oak) would temporarily impact 15.1 acres (1.8 acres more than the Proposed Action) and permanently impact 6.5 acres of aspen and aspen/oak habitats (2.8 acres more than the Proposed Action), and would indirectly impact another 170.7 acres of aspen and aspen/oak habitats (14.5 acres less than the Proposed Action) through noise and human activities, which would likely keep goshawk from nesting within this area and may also diminish habitat effectiveness in this area. Long-term, indirect impacts to goshawk habitats would be 15.7 acres more impact under Alternative 1.

Bald Eagle – Alternative 1 would see the development of 9 pad sites, and a pipeline crossing of East Muddy Creek, very similar in scope and extent to the Proposed Action. There would be 62.0 acres of construction impacts (7.7 acres less than the Proposed Action) and 27.5 acres of long-term impacts (0.1 acres less than the Proposed Action) within CPW-mapped bald eagle Winter Foraging and Winter Range.

Brewer's Sparrow – Alternative 1 would have 111.2 acres of temporary impacts from construction activities (26.8 acres less than the Proposed Action) as well as direct long-term production-related impacts to 62.9 acres of sagebrush habitats (8.6 acres less than the Proposed Action) from road and pad construction.

Bat Species – Alternative 1 would have the same level and types of impacts as the Proposed Action.

Northern Leopard Frog – Alternative 1 would have two pad sites located within irrigated pastures, and would also result in direct construction-related impacts to 17.7 acres of wetlands and irrigated pastureland habitats (2.4 acres more than the Proposed Action). Long-term production impacts would be 9.1 acres (2.6 acres more under Alternative 1).

**Table 26. Cumulative Modeled Impact to Habitats- Alternative 1 + No Action**

Vegetation Type	Existing Conditions		Construction Impacts		Production Impacts	
	Acres	% <sup>1</sup>	Acres	%	Acres	%
Aspen	1,123.9	5.7%	103.0	9.2%	109.9	9.8%
Aspen/Conifer	12.3	0.1%	0.0	0.0%	2.1	17.2%
Aspen/Oak	768.8	3.9%	98.5	12.8%	100.1	13.0%
Disturbed Area	174.7	0.9%	45.6	26.1%	91.8	52.5%
Irrigated Meadow	1,981.0	10.1%	664.5	33.5%	611.3	30.9%
Meadow	552.6	2.8%	147.6	26.7%	232.2	42.0%
Mixed Conifer	62.5	0.3%	4.6	7.3%	3.3	5.3%
Mixed Mountain Shrub	1,753.5	8.9%	166.3	9.5%	157.1	9.0%
Oakbrush	3,991.5	20.3%	476.4	11.9%	451.6	11.3%
Pinyon/Juniper	129.3	0.7%	3.0	2.3%	0.0	0.0%
Riparian Woodland	87.3	0.4%	9.3	10.7%	8.5	9.8%
Rock Outcrop	1.5	0.0%	0.0	0.0%	0.0	0.0%
Sagebrush	8,257.4	42.0%	2,100.5	25.4%	2,345.7	28.4%
Wetland/Riparian Area	671.8	3.4%	117.2	17.5%	154.4	23.0%
Willow	16.1	0.1%	4.7	29.4%	6.6	40.7%
Open Water	88.8	0.5%	14.6	16.4%	16.6	18.7%
<b>Total</b>	<b>19,673.0</b>	<b>100.0%</b>	<b>3,956.0<sup>2</sup></b>	<b>20.1%<sup>2</sup></b>	<b>4,291.2</b>	<b>21.8%</b>

<sup>1</sup> Percentage of total Bull Mountain Unit

<sup>2</sup> Use of an existing road during construction and drilling would reduce overall surface disturbance compared to production.

Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts Threatened, Endangered, and Candidate species. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The types of cumulative impacts to special status species from the implementation of Alternative 1 in combination with the No Action Alternative would be the same as for the Proposed Action. However, Alternative 1 would have 3.3 fewer miles of new or improved access roads and 6 fewer miles of pipelines than the Proposed Action, with proportionately less impacts to wildlife habitat during construction and corresponding reductions in vehicle traffic and noise during construction and production.

**No Action Alternative** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would develop up to 55 new wells on 11 well pads on fee surface and would add up to 11 wells to existing well pads. The No Action Alternative would have the same types of impacts to individual species, and the same overall determination of impacts as the Proposed Action and Alternative 1. Potential changes to the level of impact are described by species.

*Federally Listed, Proposed, or Candidate Animal Species*

Canada Lynx – An additional 54 vehicle trips per day would be generated under the No Action Alternative, 36 less than the Proposed Action or Alternative 1. It is relatively unlikely that a lynx would be struck by a vehicle given the poor lynx habitat in the greater area.

Endangered Colorado & Gunnison River Fishes – The No Action Alternative would result in annual fresh water depletions of approximately 80 ac-ft (97.6 ac-ft less than the Proposed Action), and are summarized in Table 27. Net water depletions are expected to be much lower given SG's water augmentation plan.

**Table 27. Total Water Use under No Action Alternative**

Type of Fluid Use	Acre-feet per well	Acre-feet, 66 wells
Construction, roads	NA	14.95
Pipelines	NA	0.27
Construction, pads	NA	38.67
Drilling & cementing	0.32	17.72
Hydraulic fracturing recycled water	16.24	1,071.84
Hydraulic fracturing fresh water	6.96	459.36
<b>Total all fluids</b>	<b>23.52</b>	<b>2,062.17</b>
<b>Total fresh water</b>	<b>7.28</b>	<b>480.48</b>

Notes: Hydraulic fracturing based on 6 treatments/well, 66 wells, 11.3 miles of pipelines, and 2.9 miles of new roads.

Greenback Cutthroat Trout – Greenback cutthroat trout lineage fish occur nearby in Roberts, Henderson, and other tributaries to East Muddy Creek. The construction and operation of the features in the No Action Alternative ***“may affect, and are not likely to adversely affect”*** greenback cutthroat trout lineage fish due to a pipeline crossing of the GB lineage occupied Roberts Creek. These impacts would be very short in duration, and would require implementation of construction-related proactive impact minimization measures.

*BLM Sensitive Species*

Northern Goshawk – Under the No Action Alternative, the only direct impacts to potentially suitable goshawk nesting habitat would be associated with the FSB 11-89-7 #1 pad site, road and pipeline. The rest of the activities would occur outside of suitable goshawk nesting and effective foraging habitats. Approximately 3.6 acres of construction-related and 0.8 acres of long-term production impacts (respectively 9.7 and 2.9 acres less than the Proposed Action) to aspen, aspen/oak and mixed conifer vegetation types which could support goshawk nesting habitats would result from development.

Bald Eagle – Under the No Action Alternative, a small segment of road and half of one pad (Eck 12-90-1 #1) would be located at the far western edge of the bald eagle winter range boundary. Approximately 4.4

acres of construction-related impacts would occur in mapped bald eagle Winter Range and Winter Foraging habitats, representing 0.2% of CPW-mapped available habitats in the Unit. Given the lack of gas development activities near East Muddy Creek, and even within a mile of the creek, the No Action Alternative would have no realized impact to bald eagles roosting along the creek during the winter months. Further, given the low level of gas development activities near Muddy Creek, big game use of winter ranges near the creek would likely continue with little change, and bald eagle scavenging opportunities for winter-kill or road-kill along SH 133 and East Muddy Creek would see no change from implementation of the No Action Alternative.

Brewer's Sparrow – The No Action Alternative would involve approximately 60 acres of temporary construction-related impacts (78 acres less than the Proposed Action) through the clearing of sagebrush habitats through the construction of roads, pads, flowback pits, pipelines and other surface appurtenances. Long-term production impacts would result in approximately 13.7 acres of impacts to sagebrush habitats (57.7 acres less than the Proposed Action).

Bat Species – The type of impacts from the No Action Alternative on these species and their habitats would be the same as the Proposed Action.

Northern Leopard Frog – From roads and pads, there would be approximately 26.3 acres of construction-related temporary disturbances (11 acres more than the Proposed Action) associated with pipelines and other temporary disturbances in suitable frog habitats. Additionally, there would 6.8 acres of long-term production-related impacts (0.3 acres less than the Proposed Action) to suitable frog habitats.

**Finding on the Public Land Health Standard for Threatened & Endangered Species:** Based on the Land Health Assessment for the North Fork Landscape (BLM 2007), the main issues regarding species of concern with potential cumulative impacts from this project are associated with water use and habitat connectivity. Currently, there are water quantity and quality issues associated with water diversion for agriculture in the lower North Fork and Uncompahgre watersheds. Irrigation-related reductions of instream flows and poor water quality from irrigation water return flows are hampering endangered fish recovery efforts in the Uncompahgre and North Fork Rivers (USFWS 2008). Non-native fish and irrigation practices in upper reaches of the North Fork are threatening native cutthroat trout (GB lineage) and bluehead suckers. The other issue to which development of the Unit could contribute is lynx habitat connectivity on McClure Pass. However, based on the protective stipulations listed in the Proposed Action and Alternative 1, neither would jeopardize the viability of any population of special status animal species due to habitat loss, modification, fragmentation, or indirect effects. The project would not have substantial impacts on habitat condition, utility, or function or any discernible effect on species abundance or distribution at a landscape scale. Public land health standard 4 would continue to be met.

## **MIGRATORY BIRDS**

**Affected Environment:** The Migratory Bird Treaty Act (MBTA), established in 1918, made it unlawful to pursue, hunt, kill, capture, possess, sell, purchase, or barter any migratory bird, including the feathers or other parts, nests, eggs, or migratory bird products. In addition, Executive Order 13186 set forth the responsibilities of federal agencies to implement further the provisions of the Act by integrating bird conservation principles and practices into agency activities and by ensuring that federal actions evaluate the effects of actions and agency plans on migratory birds.

As used in the MBTA, “migratory birds” include native resident species that remain in an area throughout the year as well as migrant species that move from northern to southern latitudes and from higher to lower elevations to avoid winter conditions and a seasonal shortage of suitable food.

For most migrant and native resident species, nesting habitat is of special importance because it is critical for supporting reproduction in terms of both nesting sites and food. Also, because birds are generally

territorial during the nesting season, their ability to access and utilize sufficient food is limited by the quality of the territory occupied. During non-breeding seasons, birds are generally non-territorial and able to feed across a larger area and wider range of habitats.

Among the wide variety of species protected by the MBTA, special concern is usually given to the following groups:

- Species that migrate across long distances.
- Birds of prey, which require large areas of suitable habitat for finding sufficient prey.
- Species that have narrow habitat tolerances and hence are vulnerable to extirpation from an area as a result of a relatively minor habitat loss.
- Species that nest colonially and hence are vulnerable to extirpation from an area as a result of minor habitat loss.

BLM Instruction Memorandum No. 2008-050 provides guidance toward meeting the agency's responsibilities under the MBTA. This guidance directs Field Offices to promote the maintenance and improvement of habitat quantity and quality for migratory birds of conservation concern to avoid, reduce, or mitigate adverse impacts on their habitats to the extent feasible and in a manner consistent with regional or statewide bird conservation priorities. Because of the many species of migratory birds potentially present within Field Office boundaries, BLM has focused its protection on species listed by the USFWS as Birds of Conservation Concern (BCC). This listing resulted from the 1988 amendment to the Fish and Wildlife Conservation Act, which mandates USFWS to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act (ESA) of 1973." A complete listing is available in the Biological Evaluation (Petterson 2012). Table 28 lists those species that occur or have a potential to occur within the Field Office.

**Table 28. Migratory Birds in the Uncompahgre Field Office**

Common Name	Habitat Description	Range & Status in UFO	Potential and/or Occurrence in Project Area
American bittern ( <i>Botaurus lentiginosus</i> )	Marshes and wetlands, ground nester	Spring/summer resident	Suitable habitat is limited, not likely occurring
Bald eagle ( <i>Haliaeetus leucocephalus</i> )	Nests in forested rivers and lakes, winters along major rivers, uses uplands more	Fall/winter resident, no breeding	See assessment under Sensitive Species
Ferruginous hawk ( <i>Buteo regalis</i> )	Open, rolling terrain in grasslands, shrubsteppe, agricultural meadows	Fall/winter resident	Possible migrant through area
Golden eagle ( <i>Aquila chrysaetos</i> )	Open county, grasslands, woodlands and barren areas in hilly or mountainous terrain. Nests on cliffs or large trees	Year-round, breeding	Common in Unit, unknown nest site
Peregrine falcon ( <i>Falco peregrinus</i> )	Anywhere near cliffs, often near water such as rivers, lakes. Nests on cliffs	Spring/summer resident, breeding	Possibly foraging during summer, migrates out of area for winter

**Table 28. Migratory Birds in the Uncompahgre Field Office**

Common Name	Habitat Description	Range & Status in UFO	Potential and/or Occurrence in Project Area
Prairie falcon ( <i>Falco mexicanus</i> )	Open country, prairie, deserts, agricultural fields. Nests on cliffs or rocky embankments	Year-round resident, breeding	Observed as migrant through area, migrates out of area for winter
Long-billed curlew ( <i>Numenius americanus</i> )	Wetlands in grassland communities and agricultural fields	Rare spring/fall migrant, non-breeding	Unlikely migrant through area
Flammulated owl ( <i>Otus flammeolus</i> )	Montane forests, occurs in aspen on west slope	Summer resident, breeding	Likely breeder, arrives in May, leaves in September
Gray vireo ( <i>Vireo vicinor</i> )	Pinyon-juniper and open juniper-grassland	Summer resident, breeding	Possibly at southern end of Unit
Pinyon jay ( <i>Gymnorhinus cyanocephalus</i> )	Pinyon-juniper woodland	Year-round resident, breeding	Possibly at southern end of Unit
Juniper titmouse ( <i>Baeolophus griseus</i> )	Pinyon-juniper woodlands, especially juniper, nests in tree cavities	Year-round resident, breeding	Possibly at southern end of Unit
Brewer's sparrow ( <i>Spizella breweri</i> )	Sagebrush, less often in pinyon-juniper woodlands	Summer resident, breeding	Summer resident, breeding, see Sensitive Species assessment
Cassin's finch ( <i>Carpodacus cassinii</i> )	Open montane coniferous forests, breeds/nests in coniferous forests	Year-round resident, breeding	Likely breeder in coniferous forests

The Unit is dominated by sagebrush communities, with nearby Gambel's oak and mixed shrubs. A variety of migratory birds fulfill nesting requirements within these vegetation communities from late May to mid-July and/or during spring and fall migrations.

Approximately 42% percent of the Unit is dominated by sagebrush shrublands, and provides potential habitat for one BCC species, Brewer's sparrow. See the Sensitive Species section for a discussion on impacts to this species. Other species associated with sagebrush shrublands that occur, but are not BCC species, include the western meadowlark (*Sturnella neglecta*), vesper sparrow (*Pooecetes gramineus*), and lark sparrow (*Chondestes grammacus*). Also, the golden eagle (*Aquila chrysaetos*) and prairie falcon (*Falco mexicanus*) are more likely to hunt across sagebrush areas than in the other habitat types in the Unit, all of which contain taller and more dense woody vegetation.

None of the BCC species in the UFO area are commonly associated with mixed mountain shrub and oakbrush habitats in the Unit. Migratory birds commonly associated with these habitat types but not included on the BCC list include migrants such as the Cordilleran flycatcher (*Empidonax occidentalis*), western scrub-jay (*Aphelocoma californica*), blue-gray gnatcatcher (*Poliophtila caerulea*), Virginia's warbler (*Vermivora virginiae*), MacGillivray's warbler (*Oporornis tolmiei*), lesser goldfinch (*Carduelis psaltria*), black-headed grosbeak (*Pheucticus melanocephalus*), spotted towhee (*Pipilo maculatus*), and green-tailed towhee (*P. chlorurus*).

The irrigated meadows occupying 10% of the Unit provide potential habitat for one of the listed species, golden eagle, and potentially for prairie falcon, when this species migrates through the project area.

Areas of quaking aspen or other deciduous trees (including along drainages), occupy approximately 6% of the project area, and provide potential habitat for the BCC species, the flammulated owl, house wren

(*Troglodytes aedon*), and warbling vireo (*Vireo gilvus*) as well as migrants which may use habitats periodically such as the cordilleran flycatcher, western wood-pewee (*Contopus sordidulus*), tree swallow (*Tachycineta bicolor*), and violet-green swallow (*Tachycineta thalassina*). A BCC species of riparian habitats, the willow flycatcher, is an obligate in lower-elevation riparian shrublands dominated by tall willows or structurally similar species.

The small area of mixed conifer forests on north-facing slopes in some of the deeper drainages supports limited numbers of coniferous forest species, including one BCC species, Cassin's finch, and potentially the flammulated owl. The area is generally below the elevational range of Cassin's finch for nesting, but use during winter is possible when individuals or flocks move to lower areas in search of food. Other species potentially nesting in the scattered coniferous forest stands include migrants such as Hammond's flycatcher (*Empidonax hammondi*), western tanager (*Piranga ludoviciana*), plumbeous vireo (*Vireo plumbeus*), yellow-rumped warbler (*Dendroica coronata*), chipping sparrow (*Spizella passerina*), dark-eyed junco (*Junco hyemalis*), and pine siskin (*Carduelis pinus*).

Stands or scattered individuals of pinyon pine and Utah juniper provide some habitat for three pinyon/juniper obligates on the BCC list: the pinyon jay, juniper titmouse, and gray vireo. Of these, the last species is unlikely to occur because of the location of the project area is outside the known nesting range, which is located farther to the west. Other migrants occurring in the limited pinyon-juniper include migrants such as the gray flycatcher (*Empidonax wrightii*), Say's phoebe (*Sayornis saya*), mountain bluebird (*Sialia sialis*), blue-gray gnatcatcher, and black-throated gray warbler (*Dendroica nigrescens*).

During winter, three additional species—Clark's nutcracker (*Nucifraga columbiana*), Townsend's solitaire (*Myadestes townsendi*), and the cedar waxwing (*Bombycilla cedrorum*)—may congregate in pinyon/juniper habitats in search of pine nuts (the nutcracker) or juniper berries (the solitaire and waxwing).

#### **Environmental Consequences/Mitigation:**

**Proposed Action** – Under the Proposed Action, 194.1 acres of sagebrush habitat, 36.1 acres of oakbrush woodlands, 16.5 acres of irrigated meadow would be temporarily removed within the Unit (see Vegetation section for information on acres of community types impacted). The irrigated meadows would be rapidly reclaimed, unless planned for long-term disturbances (i.e., road construction, pad sites). This could impact species such as mountain bluebird, meadowlark, and common snipe (*Gallinago gallinago*). The mixed mountain shrub/oakbrush habitats would take approximately 20 to 30 years to return to preconstruction conditions. This could displace higher conservation species over the life of the project. Bird species in this community type include spotted towhee, juniper titmouse, Virginia's warbler, blue-gray gnatcatcher, western scrub-jay, and possibly pinyon jay, among other species.

Post-development, temporarily impacted areas would likely take 2 to 4 years to reclaim to vegetated community types, but mature shrubland communities may take 30 years to reclaim the 230.1 acres of more shrubby and woodland habitats. During this time, these shrubby habitats would remain mostly unavailable for nesting by bird species that utilize this habitat type, effectively displacing these birds during this time. In some places impacts to potential nesting habitat for some migratory bird species may extend beyond the life of the project. Construction activities occurring during the bird nesting season would likely displace nesting birds. Adult birds would likely flush and abandon a nest, and they would not likely be harmed, but construction activities would likely kill chicks or fledglings if nests are not protected or avoided through the use of pre-construction surveys. As much of the construction season occurs during the spring, summer, and fall months, roads, pipelines and pads may be constructed during the bird nesting season, and impacts to nests/nestlings may occur.

In addition to direct and indirect habitat loss is the effect of habitat fragmentation on nesting bird species. While the width of the pipeline corridor or roads would not create a movement barrier to birds—unlike, for example, some small mammal species—it would have the effect of reducing the patch size of some

tree or shrub stands and increasing the amount of habitat edge. Thus, habitat-interior species—which include most of the BCC species and Neotropical migrants listed above—would be subject to additional habitat loss due their tendency to avoid the newly created habitat edge along the corridor. While the effective width of a habitat edge varies by bird species and type of habitat, a width of up to 300 feet is possible for some species. Bird species associated with grass/forb rather than shrubland communities, or with habitat edges instead of habitat interiors, would benefit slightly from the habitat modification once reclamation has been achieved. Edge species tend to include habitat generalists, such as the migratory American robin (*Turdus migratorius*) and the resident black-billed magpie (*Pica hudsonius*) common crow (*Corvus brachyrhynchos*), and common raven (*Corvus corax*). Crows, ravens and magpies are known to prey upon nestlings of smaller species, and are commonly observed foraging in irrigated pasturelands, hunting for larger insects, amphibians and smaller reptiles.

One common edge species in the region is the brown-headed cowbird (*Molothrus ater*). This species is a nest parasite on some songbird species, notably including vireos and warblers. The female cowbird lays an egg in the nest of its victim. The larger and earlier-hatching cowbird nestling then ejects the eggs or young of the host species. This project would increase edge and grassland habitats, sometimes preferred by cowbirds. This may increase nest parasitism in some of the Unit, but detectable changes in host bird populations would not be expected.

Noise produced by project-related construction, drilling, and operational activities may deter birds from roosting, foraging, or nesting in the area. The intensity, duration, and frequency of noise impacts would vary over the life of the project, but would be most intense during construction activities. Additional noise would occur during pipeline construction and from travel on roads during the operating phase of the project (see the Noise section).

Notwithstanding the sources of direct and indirect impacts discussed above, the direct or indirect loss of habitat and amount of habitat fragmentation associated with the Proposed Action would be unlikely to have a discernible effect on population sizes of any of the BCC species or other birds discussed above. This conclusion is based on both the small amount of actual habitat loss, the transitory nature of the construction phase, and the presence of existing habitat fragmentation in the project area that already has created smaller habitat patches and greater habitat edges than in an undeveloped area. Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to migratory birds. In addition, BLM may attach site-specific COAs to the APDs. The Proposed Action ***“may adversely impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range-wide.”***

**Cumulative Impacts** – The cumulative impacts assessment area for migratory birds includes areas which could be used by species likely to be found within the Bull Mountain Unit. This includes the greater Bull Mountain Unit area, and also the western slope of Colorado as it pertains to certain migratory bird environmental factors. Within the Unit, it is reasonably foreseeable that the No Action Alternative would be implemented concurrent with the Proposed Action. This would cumulatively add to impacts to vegetation communities and migratory bird habitats. See the Vegetation section for a description of acreage impacts to vegetation and thus habitat communities cumulatively impacted within the Unit.

In addition to added impacts within the Unit from implementation of the No Action Alternative, other perturbances would likely occur to migratory birds. This includes continued livestock grazing, which could disturb or impact nesting activities of ground- and shrub-nesting birds. Noxious weed treatments could also disturb nesting birds, but this temporary impact likely outweighs the ecological benefits of managing noxious weeds. Vehicle strikes would also continue to occur, primarily on higher-speed roads such as SH 133, but also on other regional roadways.

Continued loss of habitat through the conversion to farmlands, residential developments, and industrial sites is also negatively impacting migratory bird populations and distributions. Water diversion projects negatively impact wetlands and riparian habitats for birds. With additional home-building and residential



development possibly occurring within the Unit, domestic cats can have a significant impact on migratory bird populations. Development of wind-generation facilities in some areas of the plains and Great Basin states is also cited as having detrimental impacts to migratory (and residential) birds. Continuing natural gas development and continued and new coal mining activities in western Colorado will directly and indirectly impact foraging and nesting habitats, and will continue to reduce migratory bird habitats and populations. The spread of noxious weeds from organic farms, particularly in the North Fork of the Gunnison valley, would also negatively impact local native plants and habitats for migratory birds.

**Alternative 1** – See the Vegetation section for a description of impacts to community types. The types of impacts anticipated for Alternative 1 would be the same as for the Proposed Action, although there would be fewer acres of disturbance and fewer miles of roads and pipelines. Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to migratory birds. In addition, BLM may attach site-specific COAs to the APDs. Alternative 1 *“may adversely impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range-wide.”*

**Cumulative Impacts** – The types of cumulative impacts to migratory birds from the implementation of Alternative 1 in combination with the No Action Alternative would be the same as for the Proposed Action. However, Alternative 1 would have 3.3 fewer miles of new or improved access roads and 6 fewer miles of pipelines than the Proposed Action, with proportionately less impacts to habitat during construction and corresponding reductions in vehicle traffic and noise during construction and production.

**No Action Alternative** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would develop up to 55 new wells on 11 well pads on fee surface and would add up to 11 wells to existing well pads. See the Vegetation section for a description of acreage impacts to community types. Impacted shrubland/woodland habitats could displace up to 30 to 50 pair of higher conservation species over the life of the project, and would likely take 15 to 30 years to return to preconstruction conditions and. Bird species in this community type include Brewer’s sparrow, meadowlark, mountain bluebird, green-tailed towhee, and vesper sparrow, spotted towhee, juniper titmouse, Virginia’s warbler, blue-gray gnatcatcher, western scrub-jay, and possibly pinyon jay among other species. The types of impacts anticipated would be the same as for the Proposed Action. Under the No Action Alternative, the BLM would not institute mitigation measures.

## **WILDLIFE, TERRESTRIAL** (includes a finding on Standard 3)

**Affected Environment:** General Wildlife – See the Biological Evaluation for details of wildlife use patterns in the area of the Bull Mountain Unit (Petterson 2012).

CPW was consulted regarding the development of the Unit through the scoping process. CPW raised concerns over direct and indirect impacts to deer and elk habitats and habitat connectivity. Per their request, CPW was provided a copy of the BE.

Species chosen for impacts analysis have high biological and public interest, as well as regulatory guidance. Individual wildlife species and groups not specifically mentioned in this assessment are not insignificant; rather, they are not presently at issue because the limited extent of the proposed project would avoid or minimally impact these species and their habitats.

General wildlife species of interest that have habitat on or adjacent to the project location include mule deer, elk, black bear, and moose. See the Threatened, Endangered, and Sensitive Species and Migratory Birds sections for additional information on other specific species. See the Vegetation section regarding the acres of different habitat types that could be impacted under the alternatives. A complete list of wildlife species observed in the project area is provided in the BE.

Mule Deer – The Bull Mountain Unit is located at the northern end of a larger area of mule deer (*Odocoileus hemionus*) Winter Range, Severe Winter Range and a Winter Concentration Area as mapped by CPW Natural Diversity Information Source (NDIS) data (available at <http://ndis.nrel.colostate.edu/>). Deer use of the Unit occurs throughout the summer months, and the entire Unit is shown as Mule Deer Summer Range by CPW NDIS mapping. Fawning occurs in the general area, given the suitable aspen and mixed mountain shrubland habitats (which provide good cover), and abundant water sources from frequent stock tanks and creeks (which is important for nursing does). During the winter, deer mainly use pinyon/juniper habitats towards the southern end of the Unit in lower elevations and on south facing slopes, but some winter use may still occur in the northern areas of the Unit during mild winters. The southern and western facing slopes are very important for deer during the winter months due to shallower snow depths and more frequent melting, and northern and eastern slopes are less utilized due to deep and persistent snows. Deer will mobilize throughout the winter to find more desirable foraging areas, and habitat connectivity is important throughout the winter months.

During the fall months and during hunting seasons, deer congregate in the Unit and likely use some of the area as a “hunting refuge” as the Unit is mostly private land. Management of deer herd sizes by CPW is difficult when deer utilize sizable hunting refuges. However, during the fall hunters are known to be legally guided and permitted to hunt on the Falcon Seaboard, Jacobs, Aspen Leaf, Rock Creek, Buck Creek, Hughes, Hotchkiss, and other ranches within the Unit. Continued hunting of the area will be important to keep deer herds from congregating, and will help with managing deer herd sizes.

At this time, mule deer are continuing to pass through the greater area, and yet are also likely modifying movement patterns around some of the more active wells and roads to avoid human activities and traffic. Wells that are shut-in likely have such little activity around them that deer are able to use habitats with little avoidance of pads and access roads. It is documented that deer stress levels, and thus overall fitness, is compromised when mule deer utilize winter range habitats near and within areas of significant natural gas development (Sawyer et al. 2006, Petterson 2012). However, relevant research in mule deer summer ranges is not available. At this time, the total acres of surface disturbance associated with natural gas development is less than 1% of the area within the Bull Mountain Unit (Petterson 2012). While there are likely some changes in mule deer behavior in the area around wells and some of the more heavily used roads, detectable impacts to deer population levels in the area are unlikely.

In the past few years, SG has begun to fence off pads and cut-and-fill slopes around pads to keep livestock off of reclamation areas, and this would discourage deer from accessing a pad site. Recently constructed pads utilize cuttings pits (also sometimes referred to as “reserve pits”), and the pits recently used within the Unit have not been uniformly fenced with 8-foot wildlife fencing. Rather, SG will sometimes use tarps to cover the pits to prevent additional accumulation of moisture from winter snow. It is not known if any deer have fallen into these unfenced pits, but it is reasonably unlikely that they would venture too close given the lack of suitable forage, cover, and unpleasant odors of the pits. The presence of tarps would also likely discourage deer from venturing “into” a pit. Accumulated precipitation water is also common on cuttings pits.

Elk – The Bull Mountain Unit area is mapped as elk (*Cervus elaphus*) Winter Range, Severe Winter Range, Winter Concentration Area and Summer Range by CPW, and is located in DAU (Data Analysis Unit) E-14. This is a large DAU of 2,477 square miles. The majority of the DAU is located on private lands, BLM lands, and the GMUG and White River National Forests.

Computer modeling data as well as other information, including harvest and aerial surveys, show that the elk herd has increased significantly since the 1950s (CPW 2009, Giezentanner 2008). The overall population of this herd increased from approximately 2,500 animals in the early 1950s to an estimated high of over 21,000 in 1990 and 1991. The 10-year average from 1998 to 2007 is approximately 16,000. The post-hunt estimate for 2008 was 18,644 (CPW 2010).

Elk can be found in the Unit year-round, but most significant elk use of the Unit occurs generally during the spring, fall, and winter months, with some low-density summertime use. It is assumed that many elk may spend most of the spring, summer, and fall in the aspen stands at the upper elevations outside of the Unit, and along both the extreme eastern and western sides of the Unit. Hunting pressure in the area is likely light to moderate. Most, if not all of the larger ranches within the Unit provide access for hunting, as this helps keep elk from congregating on private property, but also provides an important supplemental source of income for these ranches and helps with herd size management.

Most observed elk use of the Unit area begins in late October and becomes more localized as winter range occupancy in small but important “yards” where elk tend to linger through the deepest snow months. As the snows melt in late winter and early spring elk are more widespread. During the most severe of winters (such as in 2008/2009), elk may be forced toward the more southern end of the Unit and along the Muddy Creek corridor, commonly lingering and utilizing hay spread for wintering cattle.

Elk activities through the winter months vary depending on snowfall depths and subsequent melting events. Elk scat on lower-elevation, steep, south-facing slopes in the Unit are observed to be very common, and browsing levels of brush are indicative of heavy winter utilization. However, the north-facing slopes and more level terrain do not see intense wintertime utilization. Some of the elk yards on south- and west-facing slopes are very small, but are likely critical habitats for wintering elk.

CPW maps the entire Unit as Winter Range; lower elevations of the Unit are also considered Severe Winter Range totaling 4,959.9 acres, and Winter Concentration Areas totaling 11,812.6 acres within the Unit. There are no mapped Production Areas (elk calving grounds), but some elk do calve in the Unit, especially during cool, wet springs. Most cows and calves move to higher elevations outside of the Unit as summer progresses.

Black Bear (*Ursus americanus*) – Black bear have become a major wildlife management issue in the State of Colorado. Bears commonly supplement their diets by raiding garbage cans, breaking into homes, and becoming a hazard and a nuisance. Habitat in the Unit is suitable for bear use.

Moose (*Alces alces*) – Moose were introduced by CPW onto the Grand Mesa approximately 20 years ago. Since that time, moose have expanded their range down towards areas around the Bull Mountain Unit. Moose in general utilize coniferous habitats and wetland complexes, but can also heavily utilize oakbrush and mixed mountain shrubland habitats in the area. CPW has mapped the Unit as Overall Range, which covers most of the Grand Mesa and Muddy Creek basin.

#### **Environmental Consequences/Mitigation:**

**Proposed Action** – The construction of facilities within the Unit would disturb a total of 286.9 acres (1.46% of the Unit), which would have temporary impacts to wildlife habitat due to pipeline construction and cut-and-fill slopes around roads and pads (see Vegetation section for a description of acres of habitat types impacted). Direct production impacts (loss) of potential habitats would comprise 125.9 acres (0.65% of the Unit) for road surfaces and well pad sites. The direct loss of habitat would reduce foraging, reproduction, and sheltering habitat for a number of wildlife species. However, given that direct impacts to habitat types would total less than 1% of the Unit area, no wildlife species would be greatly impacted.

Deposition of dust on roadside vegetation (36.4 miles) is a direct source of potential impacts to herbivores. In addition to the impacts on the health of potential forage described in the Vegetation section, it can result in decreased palatability and avoidance by wildlife, as well as minor increased tooth wear.

In order to estimate the indirect impacts of development on wildlife resources, a quantitatively determined area was modeled in a GIS to approximate indirect impacts and potential loss of habitat effectiveness around access roads, pipeline corridors and pad sites for activities associated with the construction,

drilling, and completion phases. Please refer to the BE for details of the modeling process. Results are summarized in Table 29.

**Table 29. Modeled Indirect Impacts to Habitats, Proposed Action**

<b>Vegetation Type</b>	<b>Indirect – Construction</b>		<b>Indirect – Production</b>	
	<i>Acres</i>	<i>% of Unit</i>	<i>Acres</i>	<i>% of Unit</i>
Aspen	135.1	12.0%	92.5	8.2%
Aspen/Conifer	0.0	0.0%	0.0	0.0%
Aspen/Oak	47.8	6.2%	42.0	5.5%
Disturbed Area	25.3	14.5%	57.6	33.0%
Irrigated Meadow	221.9	11.2%	219.1	11.1%
Meadow	157.7	28.5%	195.4	35.4%
Mixed Conifer	2.3	3.7%	2.1	3.4%
Mixed Mountain Shrub	142.7	8.1%	100.8	5.7%
Oakbrush	544.7	13.6%	407.5	10.2%
Pinyon/Juniper	3.0	2.3%	0.0	0.0%
Riparian Woodland	11.4	13.1%	13.3	15.2%
Rock Outcrop	0.0	0.0%	0.0	0.0%
Sagebrush	2,073.0	25.1%	2,218.4	26.9%
Wetland/Riparian Area	100.7	15.0%	99.6	14.8%
Willow	2.6	16.0%	2.3	14.0%
Open Water	9.8	11.1%	10.9	12.3%
<b>Total</b>	<b>3,478.0</b>	<b>17.7%</b>	<b>3,461.4</b>	<b>17.6%</b>

Indirect impacts from the development and use of roads, pad sites, flowback pits and other areas of high human activity would reduce the availability and suitability of habitats near these sites. The actual level of habitat impact would vary for each species that may utilize the area. Some species, such as elk, would be much more sensitive to indirect impacts, and would avoid otherwise available habitats at a much greater distance than other species, such as northern leopard frog, which would not likely avoid suitable habitat next to developed areas.

**Mule Deer** – Mule deer have shown considerable accustomization to human activities within the area, and rarely flee very far from vehicular use of roads. However, it is well-documented that deer stress levels, and thus overall fitness, are compromised when mule deer utilize habitats near and within areas of major natural gas development. At this time, the level of natural gas development in the Unit is not considered to be major, and while there is likely some change in mule deer behavior in the area around producing wells and some of the more heavily used roads, detectable impacts to deer population levels in the area are unlikely.

Direct impacts (i.e., mortality) to mule deer are unlikely in the project area given that all roads within the Unit are dirt roads (with the exception of SH 133), and road speeds are generally below 30 mph. Within the Unit, the slow road speeds and mobility of deer would limit traffic-related deer mortality. The level of traffic on SH 133 from development of the Proposed Action would increase by 6% during the construction and drilling phase, which would likely have additive direct mortality impacts to mule deer wintering in lower elevations along SH 133 (CDOT 2011, Otak 2011). This would likely impact individual deer, but no population level impacts would be expected.

Without fencing around cutting pits (which is not uniformly utilized in the Unit at this time), there is a remote chance that deer could become stuck in a pit, or ingest waters on pit surfaces.

See the Vegetation section for a detailed description of the acres of impact to specific vegetation communities. The Proposed Action would result in 216 acres (1.1% of the Unit) of construction

disturbance to potential deer habitat types, and approximately 97.4 acres of production disturbance (0.5% of the Unit). These direct impacts to habitats would be relatively small in scale.

Modeled indirect impacts from implementation of the Proposed Action would include 3,478 acres of potential mule deer habitats, or 17.7% of potential mule deer habitats within the Unit. After construction is complete, long-term indirect impacts would be reduced to approximately 3,461.4 acres, or 17.6% of the Unit.

The development of 9 pad sites and accompanying access roads and pipelines would result in a total of 69.3 acres of short-term impacts and 19.9 acres of long-term direct impacts to mule deer Winter Range. Two of these pads would occur on the edge of Winter Concentration areas, impacting 1.4 acres of this habitat type. One pipeline would clip approximately 445 feet of Severe Winter Range. Indirect impacts, as modeled, would result in a total impact to all winter ranges of 1,264.9 acres; however, 429.6 acres, or 34% of those impacts would be from pipeline corridors, which would not have long-term impacts to winter ranges. Nevertheless, over 27% of mule deer winter ranges in the Unit may see some level of diminished effectiveness due to the nearby presence of roads and pad sites.

In summary, long-term impacts to habitat would decrease after major activities associated with development are complete, and thus traffic levels and heavy construction activities would also decrease. However, compared to current conditions, the area would see long-term increased human activity levels which would diminish the effectiveness of the area for mule deer. Mule deer densities within the Unit may decrease over time with full development of the Unit due to increased human activities, but the relatively small footprint of the project would allow for adequate forage for mule deer throughout the area. The moderately large indirect impact area (17.7% of the Unit) would indicate that there could be significant shifts in mule deer distributions across the Unit. The long-term indirect impacts to deer would be largely dependent on the amount of traffic and human activities in the Unit. With automation of facilities and reduced traffic, it is conceivable that deer may continue to utilize much of the Unit. However, if wells are checked daily or roads see regular traffic, then deer densities and use of the Unit would likely remain lower than current levels. Overall deer populations would not be expected to decrease from the implementation of the Proposed Action, but deer densities in the Unit would be lower.

It would be difficult to anticipate if wintering deer would shift their use patterns more than deer summering in the Unit. During the summer and fall months, deer often seem to be more sensitive to human disturbances (which would also coincide with the construction season and fall hunting seasons), and wintering mule deer seem more accepting of human activities (which coincides with less human activity in the Unit). Mule deer may indeed change winter range utilization patterns and move to less impacted areas, but given the low levels of human activity anticipated in the winter, deer may tend to maintain traditional use patterns. Indirect impacts to deer would be realized through lower fawn weights as they enter the winter season and possibly higher over-winter fawn mortality due to does and fawns needing to travel more or avoid otherwise available habitats near roads, pads, pits and other areas of human activity, which could therefore limit their use of preferred habitats and refugia and increase their metabolic outputs.

Elk – Direct impacts (i.e., mortality) to elk are unlikely in the project area given that all roads within the Unit are dirt (with the exception of SH 133), and road speeds are generally below 30 mph. It is possible that some elk may be struck while attempting to cross a road, but this is relatively unlikely given the road speeds (which are even slower during the winter months) and agility of elk. Mortality to elk along SH 133 is currently occurring due to existing traffic patterns, and development of the Unit would contribute to additional traffic on SH 133. The level of traffic on SH 133 from development of the Proposed Action would increase by 6% (CDOT 2011, Otak 2011), depending on the time of year and level of development (see the Transportation section later in this document). Traffic increases would likely have additive direct mortality impacts to elk wintering in lower elevations along SH 133. This would likely impact individual elk, but no population-level impacts would be expected, especially when considering that elk would be

wintering near SH 133 when development-related traffic volumes are lower, outside of the summer construction season.

Without fencing around cutting pits (which is not uniformly utilized in the Unit at this time), there is a remote chance that elk could become stuck in a pit, or ingest waters on pit surfaces. However, this is relatively unlikely given the odor of cuttings pits, tarps covering pits, and the presence of livestock fencing around pads. While elk mortality from unfenced pits is very unlikely, without wildlife fencing around pits it cannot be ruled out.

See the Vegetation section for a detailed description of the acres of impacts to specific vegetation communities. The Proposed Action would result in 216 acres (1.1% of the Unit) of short-term disturbance to potential elk habitat types from road, well pad, and pipeline construction and other surface disturbances, and approximately 97.4 acres of long-term disturbance, or 0.5% of the Unit from access roads and well pads. These direct impacts to habitats are very small in scale.

There may be a 2- to 3-year period when pipeline corridors provide lower elk browsing opportunities on approximately 81.6 acres. It is assumed that over 3 years or so, most of the cleared pipeline corridors and other temporary use areas would be revegetated and once again provide elk with more suitable foraging. However, in some circumstances where landowners or other agencies require the planting of more aggressive non-native grasses and forbs, the recovery of native forbs and shrubs into these temporarily disturbed acres may take much longer due to the competitive exclusion of desirable native plants.

Assuming that decreased elk activities would occur due to indirect impacts, GIS modeling was used to determine the acreage of habitats likely to see decreased elk activity (see previous discussion in mule deer section, and BE for more information). Elk would avoid otherwise suitable habitats near access roads, construction areas, and active drilling sites during the construction process due to human activities, traffic, loud noises, and other perceived threats by elk. This is not to say that elk would never occur near roads, pads, etc. But it is reasonable to assume that decreased utilization would occur near areas of higher human activity, noise, and traffic. Indirect impacts which may occur during the summer construction, drilling, and completion seasons are tempered by the fact that during the summer months most elk have migrated to higher terrain outside of the Unit. Construction, road use, and drilling activities occurring during the calving period (late May through late June) which occur near aspen stands and oakbrush stands may displace some individual calving elk, or disturb some calving activities. As most cows will have left the Unit by this time of year, widespread impacts are not anticipated.

GIS-modeled indirect impacts from construction would be a conservatively estimated 3,478 acres, or 17.7% of the Unit. However, using a simple ¼ mile buffer area around all features, approximately 10,639.5 acres, or 54% of the Unit would be impacted. Given the sensitivity of elk to disturbances, the larger modeled area may be more appropriate for elk during the spring, summer, and fall seasons. Elk appear to be less likely to leave an area during the winter months, and use of the ¼ mile buffer is not warranted. Long-term, the use of roads and activities at pads would result in a reduced indirect impact area (as modeled) of 3,461.4 acres, or 17.6% of the Unit (Pettersen 2012). These numbers do not account for existing indirect impacts along SH 133 or CR 265. Modeled indirect impacts to Severe Winter Range would affect 896.2 acres (18% of Severe Winter Range habitats in Unit), and modeled indirect impacts to Winter Concentration Areas would affect 2,449.0 acres (but approximately 774 acres are from pipeline corridors).

In summary, the development of the Unit under the Proposed Action would create a direct loss of less than 2% of the potentially available habitats under any of the proposed activities. This loss of habitat would have an insignificant impact to elk. However, traffic and human activities in the Unit would have a larger indirect impact footprint, especially during the construction and drilling phases, possibly resulting in 17.7% up to 54% of the Unit seeing areas with reduced habitat effectiveness for elk. However, the time of year when elk are most common in the Unit (winter) would be mostly outside of active periods of

construction, drilling, and well completion, and modeled indirect impacts, at least for elk, are likely overstated.

Elk would continue to use, migrate through, and may even be seen very close to the facilities and roads within the Unit, but scientific literature indicates that elk utilization of habitats near roads decreases with increasing traffic levels, and new roads reduce habitat effectiveness for elk (see Petterson 2012). Given the size of the project, its location, and surrounding habitats, this project could have moderate impacts on elk densities and distribution within the Unit. However, it is unlikely that elk populations within the greater Muddy Creek basin would decrease, but elk densities across the Unit would likely be lower, or at least elk would be significantly redistributed in some areas, with elk seeking habitats away from facilities and higher-use roads. This may place elk in suboptimal habitats. Some areas would likely support similar elk densities as currently occurring due to low levels of development, but some areas proposed for development occur very close to, or within critical winter habitats and impacts to elk in these areas would have disproportionately large impacts.

Black bear – The Proposed Action would have negligible impacts on bear populations or bear habitat. Bear-proof trash containers should be used on-site at all times to minimize visitation by bears.

Moose – The development of the Unit would likely preclude moose lingering or utilizing habitats within the modeled indirect impact areas (see previous discussions). After construction, the low human activity levels around individual well pads would likely cause moose to leave if humans entered the area; depending on the distance from the pad site, however, some moose may linger, or would not “flee” from human activities on pads and roads. This is not to say that moose stress levels would not rise or changes in behavior would not be noticed.

Increased traffic on local roads would also reduce moose use of habitats near roads. Increased mortality from vehicle strikes is not likely within the project area, as road speeds are fairly low, but moose vehicle strikes have been documented on SH 133 on the east side of McClure pass near Placita. In summary, while this project may have minor localized impacts on the ability for moose to continue to fully utilize habitats in the Unit, the Bull Mountain Unit is not optimal moose habitat, and moose use of this area would already likely be relatively infrequent. Therefore, the Proposed Action would have negligible impacts on moose or moose habitat. Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to wildlife. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The cumulative impacts assessment area for terrestrial wildlife is considered to be the greater Bull Mountain Unit and surrounding lands. Within the Unit, cumulative development of the Proposed Action in combination with the No Action Alternative would result in impacts to area habitats as presented in the Threatened, Endangered, and Sensitive Species section of this document.

Mule Deer – Within the greater Muddy Creek basin, SG and Gunnison Energy Corporation’s maintenance and development of natural gas wells may cumulatively increase the impacts to mule deer. At this time SG’s existing gathering pipelines and the Bull Mountain Pipeline bisect suitable mule deer habitats. However, pipelines are generally considered to be temporary impacts, and native grass, forb, and shrub recruitment appears to be occurring in the areas where reclamation is underway.

Cumulative direct and indirect impacts to mule deer within the Unit are summarized in Table 30 (Petterson 2012).



**Table 30. Cumulative Impacts to Mule Deer Habitat Winter Ranges, Proposed Action + No Action**

<b>Habitat &amp; Impact Type</b>	<b>Cumulative Direct Impacts</b>		<b>Cumulative Indirect Impacts</b>	
	<i>Acres</i>	<i>% of Total</i>	<i>Acres</i>	<i>% of Total</i>
<b>Winter Range</b> (4,613 acres)				
Construction	96.3	2.1%	1,052.8	22.8%
Production	31.9	0.7%	743.3	16.1%
<b>Severe Winter Range</b> (196.5 acres)				
Construction	0.5	0.3%	11.6	5.9%
Production	0.0	0.0%	0.0	0.0%
<b>Winter Concentration</b> (207.4 acres)				
Construction	1.5	0.7%	17.7	8.5%
Production	1.2	0.6%	31.1	15.0%

Direct cumulative impacts within the Unit would be relatively minor, with just over 2% of the total potential mule deer winter range habitat being impacted by development.

The largest cumulative indirect impacts to mule deer from the development of the Unit would come from decreased use of otherwise available habitats around the roads and pad sites through avoidance due to high levels of traffic, noise and human activities. Domestic sheep grazing and associated guard dogs also occur across much of the northern half of the Unit. These guard dogs have been observed to prey on wildlife around flocks, and deer would likely avoid the general area when sheep bands are nearby.

Elk – Cumulative impacts within the greater Muddy Creek basin as a result of SG and Gunnison Energy’s maintenance and development of natural gas wells would similar to those for deer. Elk are commonly seen lingering on reclaimed pipeline corridors, and appear to have no adverse impacts from the presence of the reclaimed corridors. While corridors do not appear to have negative impacts to elk, it is well-documented that roads and pad sites result in decreased habitat effectiveness around these features, causing elk to avoid otherwise-available habitats.

Cumulative direct and indirect impacts to elk habitats within the Unit are summarized in Table 31.

**Table 31. Cumulative Impacts to Elk Habitats and Winter Ranges, Proposed Action + No Action**

<b>Habitat &amp; Impact Type</b>	<b>Cumulative Direct Impacts</b>		<b>Cumulative Indirect Impacts</b>	
	<i>Acres</i>	<i>% of Unit</i>	<i>Acres</i>	<i>% of Unit</i>
<b>Winter Range</b> (19,673 acres)				
Construction	396.6	2.0%	4,445.5	22.6%
Production	168.2	0.9%	4,423.9	22.5%
<b>Severe Winter Range</b> (4,960 acres)				
Construction	112.2	2.3%	1,304.4	26.3%
Production	42.2	0.9%	989.9	20.0%
<b>Winter Concentration</b> (11,813 acres)				
Construction	292.6	2.5%	3,287.6	27.8%
Production	119.0	1.0%	3,050.5	25.8%

Within directly and indirectly impacted areas, elk would not linger for long periods of time, would have decreased foraging, and would generally avoid the area due to heavy traffic during construction and drilling periods. However, elk are generally not in the Unit in large numbers during the summer construction season. While it is very likely that some level of elk wintertime activity would continue to occur within the Winter Range areas around the access roads and pad sites, modified overall use patterns and avoidance of these areas is likely.

Domestic sheep grazing and associated guard dogs also occur across much of the Unit. These guard dogs have been observed to hunt for wildlife prey around flocks, and elk would likely avoid the general area when sheep bands are nearby. However, sheep bands have generally left the Unit by the time elk arrive during the winter season.

Other Wildlife Species – Other wildlife species in the Bull Mountain Unit are considered to be relatively common, which is not to say that they are not insignificant, but rather their populations, habitats, and distributions are not at issue, and the cumulative impacts from development of the Unit and reasonably foreseeable activities on surrounding lands would not jeopardize the viability of any animal population. The project would have no significant consequence on habitat condition, utility, or function, nor have any discernible effect on species abundance or distribution at any landscape scale for other wildlife species. Cumulative impacts to general wildlife species would be similar to issues discussed under the Threatened and Endangered section of this document. Species of concern have been covered in other sections of this EA.

**Alternative 1** – The types of short-term and long-term direct and indirect impacts to wildlife under Alternative 1 would be the same as for the Proposed Action. There would be 31.1 fewer acres of construction disturbance (4.5 fewer from disturbance during production), and 2.3 fewer miles of roads than the Proposed Action. Table 32 summarizes modeled indirect impacts to habitat in the Unit. Cumulative impacts to general wildlife species would be similar to issues discussed under the Threatened and Endangered section of this document. Species of concern have been covered in other sections of this EA.

**Table 32. Modeled Indirect Impacts to Habitats, Alternative 1**

<b>Vegetation Type</b>	<b>Indirect – Construction</b>		<b>Indirect – Production</b>	
	<i>Acres</i>	<i>% of Unit</i>	<i>Acres</i>	<i>% of Unit</i>
Aspen	79.2	7.1%	70.5	6.3%
Aspen/Conifer	0.0	0.0%	0.0	0.0%
Aspen/Oak	89.2	11.6%	79.7	10.4%
Disturbed Area	24.6	14.1%	59.9	34.3%
Irrigated Meadow	243.7	12.3%	233.3	11.8%
Meadow	103.5	18.7%	157.9	28.6%
Mixed Conifer	2.3	3.7%	2.1	3.3%
Mixed Mountain Shrub	120.6	6.9%	106.3	6.1%
Oakbrush	449.9	11.3%	397.5	10.0%
Pinyon/Juniper	3.0	2.3%	0.0	0.0%
Riparian Woodland	9.0	10.4%	8.5	9.7%
Rock Outcrop	0.0	0.0%	0.0	0.0%
Sagebrush	1,626.5	19.7%	1,935.6	23.4%
Wetland/Riparian Area	97.0	14.4%	95.3	14.2%
Willow	5.0	31.3%	6.3	39.2%
Open Water	12.8	14.4%	13.1	14.7%
<b>Total</b>	<b>2,866.3</b>	<b>14.6%</b>	<b>3,166.0</b>	<b>16.1%</b>

Mule Deer – See the Vegetation section for a description and comparison of impacts to vegetation and habitat types for Alternative 1.

Modeled short-term indirect impacts from Alternative 1 would occur across 2,866.3 acres of potential mule deer habitats. This is approximately 14.6% of potential mule deer habitats within the Unit (3.1% less than the Proposed Action). Long-term impacts (i.e., not including pipeline corridors) would affect 3,166.0 acres (295.4 acres less than the Proposed Action), or 16.1% of the Unit.

Development of 8 pad sites, roads, and pipelines would result in a total of 75.2 acres of short-term direct impacts to mapped mule deer Winter Ranges (7.2 acres less than the Proposed Action) and 30 acres of long-term direct impacts (.5 acres more than the Proposed Action). One of these pads would occur on the edge of Winter Concentration areas, directly impacting 1.4 acres. There would be no pads within Severe Winter Range, but 0.5 acre of a pipeline corridor would cross into Severe Winter Range.

Modeled indirect short-term impacts to winter ranges would affect 771.6 acres (162.6 acres less than the Proposed Action); however, 90 acres of those impacts (0.87% less than the Proposed Action) would be from pipeline corridors and would not have long-term impacts to winter ranges. Nevertheless, around 14.8% of mule deer winter ranges in the Unit may see some level of long-term diminished effectiveness due to the nearby presence of roads and pad sites.

In summary, short-term direct impact to habitats in the Unit would be very small (1.1%), and long-term direct impacts to habitat even smaller (0.5%). However, modeling of indirect impacts shows potential reduced habitat effectiveness of 16.1% of the Unit in the short term and 16.1% (1.5% less than the Proposed Action) in the long term. The types of impacts would be the same as described for the Proposed Action.

Elk – Under Alternative 1, short-term direct and indirect disturbances to potential elk habitat types would be the same as for mule deer (see the Vegetation section for a detailed description of impacts to vegetation types and habitats). There may be a 2- to 3-year period when corridors provide few elk grazing opportunities. This impact would have very little impact to wintering elk, as most grasses are covered by snow and elk shift their diet to shrubs during the winter.

Short-term direct impacts to Winter Range from construction of pipelines, roads, and pads would be conservatively estimated at 255.7 acres, or 1.3% of Winter Ranges in the Unit (0.6% more than the Proposed Action). Direct impacts to Severe Winter Range would be 69.5 acres, and impacts to Winter Concentration Areas would be 156.5 acres. Long term, the use of roads and activities at pads would result in a direct impact area of 121.3 acres of Winter Range, 29.2 acres of Severe Winter Range, and 77.9 acres of Winter Concentration Areas. These values are somewhat larger than the impacts under the Proposed Action, but by less than 1%. These numbers do not account for existing indirect impacts along SH 133 or CR 265.

Modeled long-term indirect impacts to Winter Range is 3,166.1 acres (16.1% of Winter Range habitats in Unit), 706.2 acres in Severe Winter Range (14.2%), and 2,016.7 in Winter Concentration Areas (17.1%). These values range from 7% to 3% more impact to various Winter Ranges than under the Proposed Action (see Petterson 2012). The ¼-mile buffer area would be 8,641.3 acres, or approximately 44% of the Unit.

Black bear – Alternative 1 would have negligible impacts on bear populations or bear habitat.

Moose – The development of the Unit under Alternative 1 would have similar impacts to the Proposed Action.

Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to wildlife. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The types of cumulative impacts to migratory birds from the implementation of Alternative 1 in combination with the No Action Alternative would be the same as for the Proposed Action. However, Alternative 1 would have 3.3 fewer miles of new or improved access roads and 6 fewer miles of pipelines than the Proposed Action, with proportionately less impacts to habitat during construction and corresponding reductions in vehicle traffic and noise during construction and production. Tables 33 and 34 summarize cumulative direct and indirect impacts to mule deer and elk habitat, respectively.

**Table 33. Cumulative Direct Impacts to Mule Deer Habitat Winter Ranges, Action Alternatives + No Action**

Habitat & Impact Type	Cumulative Direct Impacts		Cumulative Indirect Impacts	
	<i>Acres</i>	<i>% of Total</i>	<i>Acres</i>	<i>% of Total</i>
<b>Winter Range</b> (4,613 acres)				
Construction	89.6	1.9%	895.4	19.4%
Production	47.0	1.0%	710.8	15.4%
<b>Severe Winter Range</b> (196.5 acres)				
Construction	0.5	0.3%	11.8	6.0%
Production	0.0	0.0%	0.0	0.0%
<b>Winter Concentration</b> (207.4 acres)				
Construction	1.4	0.7%	15.9	7.7%
Production	89.6	1.9%	27.6	13.3%

**Table 34. Cumulative Direct Impacts to Elk Habitats and Winter Ranges, Action Alternatives + No Action**

Habitat & Impact Type	Cumulative Direct Impacts		Cumulative Indirect Impacts	
	<i>Acres</i>	<i>% of Unit</i>	<i>Acres</i>	<i>% of Unit</i>
<b>Winter Range</b> (19,673 acres)				
Construction	369.6	1.9%	3,956.0	20.1%
Production	166.9	0.8%	4,291.2	21.8%
<b>Severe Winter Range</b> (4,960 acres)				
Construction	110.2	2.2%	1,162.6	23.4%
Production	44.0	0.9%	982.4	19.8%
<b>Winter Concentration</b> (11,813 acres)				
Construction	256.2	2.2%	2,715.2	23.0%
Production	116.3	1.0%	2,943.9	24.9%

**No Action Alternative** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would develop up to 55 new wells on 11 well pads on fee surface and would add up to 11 wells to existing well pads. The types of direct and indirect impacts to wildlife would be the same as for the Proposed Action. Modeled impacts to habitat are summarized in Table 35.

**Table 35. Modeled Indirect Impacts to Habitats, No Action**

Vegetation Type	Indirect – Construction		Indirect – Production	
	<i>Acres</i>	<i>% of Unit</i>	<i>Acres</i>	<i>% of Unit</i>
Aspen	26.5	2.4%	48.7	4.3%
Aspen/Conifer	0.0	0.0%	2.1	16.8%
Aspen/Oak	19.0	2.5%	23.6	3.1%
Disturbed Area	25.4	14.5%	79.5	45.5%
Irrigated Meadow	462.1	23.3%	429.8	21.7%
Meadow	82.7	15.0%	179.3	32.4%
Mixed Conifer	2.3	3.7%	1.2	1.9%
Mixed Mountain Shrub	71.6	4.1%	68.4	3.9%
Oakbrush	69.3	1.7%	148.0	3.7%
Pinyon/Juniper	0.0	0.0%	0.0	0.0%
Riparian Woodland	0.3	0.4%	0.5	0.6%
Rock Outcrop	0.0	0.0%	0.0	0.0%
Sagebrush	731.2	8.9%	1,060.5	12.8%

**Table 35. Modeled Indirect Impacts to Habitats, No Action**

<b>Vegetation Type</b>	<b>Indirect – Construction</b>		<b>Indirect – Production</b>	
	<i>Acres</i>	<i>% of Unit</i>	<i>Acres</i>	<i>% of Unit</i>
Wetland/Riparian Area	34.4	5.1%	87.5	13.0%
Willow	0.0	0.0%	1.5	9.5%
Open Water	2.1	2.4%	7.7	8.7%
<b>Total</b>	<b>1,527.0</b>	<b>7.8%</b>	<b>2,138.2</b>	<b>10.9%</b>

**Mule Deer** – See the Vegetation section for a description and comparison of direct impacts to vegetation and habitat types for the No Action Alternative.

The short-term direct impacts to Winter Range from construction are estimated at 17.2 acres (65.2 acres less than the Proposed Action), or .4% of the Winter Range habitats in the Unit. There would be no impacts to Severe Winter Ranges under the No Action Alternative. A minor 0.5 acre of long-term direct impacts to Winter Concentration Areas would occur (0.7 acres more than under the Proposed Action).

Modeled short-term indirect impacts to Winter Range were 199.2 acres (4.3% of Winter Range habitats in the Unit). There were no indirect impacts to Severe Winter Ranges. Long-term, there were 281.9 acres of indirect impacts to Winter Ranges (6.1%), and 26.9 acres of indirect impacts to Winter Concentration Areas (13%), which is 1.8% less than under the Proposed Action. The ¼ mile buffered area around activities was 5,221.9 acres, or approximately 26% of the Unit.

In summary, given the small area impacted directly in the short term, and the moderate area indirectly impacted in the long term (7.8% and 10.9%, respectively), the No Action Alternative would have no detectable impacts to mule deer population numbers; however, it is likely that some individual mule deer would be directly and indirectly impacted. The types of impacts under the No Action Alternative would be the same as for the Proposed Action.

**Elk** – See the Vegetation section for a description and comparison of direct impacts to vegetation and habitat types for the No Action Alternative.

The No Action Alternative would create direct short-term impacts to approximately 131.2 acres of elk Winter Range (155.7 acres less than the Proposed Action) through the construction of roads, pads, flowback pits, pipelines, and other surface appurtenances, or 0.7% of the Winter Range habitats in the Unit. Direct impacts to Severe Winter Range would be 44.1 acres (0.9%), or 28.5 acres less than the Proposed Action. Impacts to Winter Concentration Areas would be 115.7 acres (1%), or 81.6 acres less than the Proposed Action. Long-term, there would be 69.9 acres of impact to Winter Ranges (0.4%), 19.4 acres of impact to Severe Winter Range (0.4%), and 54.7 acres of impact to Winter Concentration Areas (.5%). These values are less than the Proposed Action indirect impacts by less than 0.5%. The ¼ mile modeled impact area was 5,122.9 acres, or 26% of the Unit. The types of impacts (i.e., how they would affect elk) under the No Action Alternative would be the same as for the Proposed Action.

**Black bear** – The No Action Alternative would have insignificant impacts on bear populations or bear habitat. Bear-proof trash containers should be used on-site at all times to minimize visitation by bears.

**Moose** – The development of the Unit under the No Action Alternative would have similar impacts to Proposed Action, with the main difference being a 10% decrease in indirect impacts to surrounding habitats.

**Finding on the Public Land Health Standard for Plant and Animal Communities** (partial; see also Vegetation; Invasive, Non-native Species; and Wildlife, Aquatic): Based on the Land Health Assessment for the North Fork Landscape (BLM 2007), the main issues regarding animal communities with potential cumulative impacts from this project are associated with the health of habitat types, particularly stands of older oakbrush, the impact of noxious weeds, and the impacts of livestock grazing. Older stands of

oakbrush provide important habitat components for a number of species. Noxious weeds are an ongoing threat to regional wildlife habitats that could be exacerbated by development of the Unit, and are becoming a greater issue in the North Fork valley as a result of the recent decrease in the treatment of weeds due to the increase in organic farms. Overgrazing and loss of native forb and grass diversity and a reduction in shrub vigor and health also contribute to diminished wildlife habitats. Avoidance of stands of old-growth oakbrush would reduce regional loss of this habitat type. Aggressive and timely noxious weed treatments, as described in the Proposed Action and alternatives, would be critical to prevent degradation of habitats within the Unit. Use of native plants for reclamation would ensure more long-term availability of suitable wildlife habitats. Livestock exclosures, and in some cases changes in grazing strategies, would be necessary to ensure that revegetation efforts are successful, particularly in wetland areas and in shrub-dominated habitats. Based on the protective stipulations listed in the Proposed Action and Alternative 1 there would be no jeopardy to the viability of any animal population. The project would have no great consequence on habitat condition, utility, or function; however, it is likely that the Proposed Action, Alternative 1, and No Action would likely change the abundance for elk and possibly for mule deer at the project scale, at least during the construction and drilling phase. During production, if human activities decrease, elk and mule deer may be able to utilize habitats more readily. Indirect impacts would result in diminished habitat effectiveness across approximately 8% to 18% of the Unit, which would likely cause elk (and mule deer) distributions and densities to change. Cumulatively, indirect impacts would result in diminished habitat effectiveness across approximately 20% to 23% of the Unit. Private landowner requirements (and sometimes from state agency requirements) to use non-native agricultural grasses and forbs would likely reduce the availability of native plant habitats, and would reduce wildlife habitats in some areas. Public land health standard 3 would continue to be met.

#### **WILDLIFE, AQUATIC** (includes a finding on Standard 3)

**Affected Environment:** The Bull Mountain Unit contains a number of fish-bearing streams, including Henderson, Roberts, Drift, Lee, East and West Muddy, and Ault Creeks. However, East Muddy Creek can only support fish during the late summer and fall months, the rest of the year it is too silty and is likely ineffective for any significant fish use (Pettersen 2012). A multitude of smaller tributaries contribute perennial and ephemeral flows to these creeks.

In terms of aquatic life, all of these streams are limited primarily by flows, which are flashy and seasonally very low, and by heavy sediment loads in East Muddy Creek. Other limiting factors include the type of substrate and the presence, density, and width of riparian plant communities. These streams are sourced both directly and indirectly from snowpacks at higher elevations on the flanks of Huntsman Ridge, the Ragged Mountains, and Spruce Mountain to the north of the Unit, but some of these creeks are sourced by lower-elevation hills, and these creeks (mainly on the western side of the Unit) tend to be ephemeral. Much of the recharge from snowpack enters the streams as groundwater inflow from colluvium and shallow bedrock. Substrates vary longitudinally along the streams and include reaches dominated by cobbles and finer sediments.

Fish surveys by CPW have documented the presence of greenback cutthroat trout (*Onchorhynchus clarkii stomias*) lineage fish—a Federally listed threatened subspecies—in upper reaches of Roberts and Henderson Creeks located at the northern end of the Unit. Other creeks in the Unit may contain greenback cutthroat trout, including Lee Creek, Drift Creek and Ault Creek most notably. See the section on Threatened, Endangered, and Sensitive Species for detailed information.

A non-native sport fish, the brook trout, occupies lower reaches of Lee Creek. This trout of eastern North America has been widely introduced in mountainous areas of Colorado because of its tolerance for slightly warmer waters than the cutthroat trout and its ability to reproduce successfully in streams with very small flows. Brook trout may also occur in other creeks within the Unit. Brook trout can competitively displace cutthroat trout.



Aquatic macroinvertebrates living in perennial streams such as Lee Creek during a portion of their lifecycles include larvae of stoneflies, mayflies, and some caddisflies in fast-flowing reaches with rocky or detrital substrates. Both the aquatic larvae and winged adults of stoneflies, mayflies, and caddisflies are probably the main prey for trout in Lee, Roberts and Henderson Creeks, and other creeks with low-sediment loading. Other terrestrial invertebrates that land or fall onto the surface or are carried into the stream in runoff from adjacent uplands can also be prey for trout. In slow-flowing portions of area wetlands with fine substrates, and in East and West Muddy Creeks, aquatic macroinvertebrates probably include the larvae of midges, mosquitoes, and some caddisflies. These species are able to tolerate relatively warm, turbid, and poorly oxygenated waters, and their more abbreviated larval stages allow them to reproduce in intermittent streams and in seasonally inundated overbank areas.

### **Environmental Consequences/Mitigation:**

**Proposed Action** – The Proposed Action has been designed to prevent or minimize disturbance to Roberts Creek and Ault Creek through additional studies and a series of mitigation measures to protect the aquatic resource (see Threatened, Endangered, and Sensitive Species). Revegetation of riparian areas and replacement of existing culverts with more fish-friendly culverts is part of the Proposed Action.

The pipeline crossing the lower reaches of East Muddy Creek would be bored, or crossed during low-flow conditions, and riparian areas would also be quickly stabilized and revegetated per Army Corps of Engineers 404 permitting.

At the trenched crossing of other streams and wetlands, the width of the construction corridor would be kept to the minimum width possible to limit modification to the streambed. Indirect impacts due to runoff from the construction zone on the approach/departure sides of the stream would also be limited by narrowing the construction corridor and not stockpiling soil or other excavated material in proximity to the stream. SG currently has a number of major pipelines in place, which would also help limit the need for new large-scale pipeline crossings of wetlands and waterways.

Water depletions from the Ault Creek drainage would result from use of waters out of Aspen Leaf Reservoir. SG currently has purchased a total of 15 ac-ft (7.4%) of the combined waters of the 86-acre-foot Aspen Leaf Reservoir and the 116-acre-foot Ault Reservoir (which feeds Aspen Leaf). The primary purpose of these reservoirs is flood irrigation of hay meadows on the Aspen Leaf Ranch. Other base flows occur within the Ault Creek drainage, including the perennial eastern fork of Ault Creek. Water depletions may have impacts to greenback habitats, but no realized effects to greenback trout would be anticipated. In the East Muddy Creek drainage, SG has reappropriated existing water depletions from irrigation to industrial use. Therefore no significant decreases in instream flows would be anticipated in East Muddy Creek or downstream habitats. For detailed analyses, See the Biological Evaluation (Pettersen 2012). Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to aquatic wildlife. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – Cumulative impacts to aquatic wildlife and their habitats in the area from the implementation of the Proposed Action in combination with the No Action Alternative could include continued spread of whirling disease, degradation of riparian corridors due to domestic livestock grazing, sedimentation of suitable habitats from upland ground-disturbing projects, gravelling/sanding of highways, application of magnesium chloride and other ice-melting chemicals to roads, and continued natural gas exploration and development activities. Stocking of area streams and lakes with non-native salmonids would continue to pose a hybridization and competition threat to greenback cutthroat trout. The presence of brook trout in the Muddy Creek watershed would be a definite threat to long-term greenback cutthroat trout persistence.

Cumulatively, this project would not add to greenback cutthroat trout hybridization threats. The development of roads, pipelines, and pads in the Bull Mountain Unit and on USFS lands would cumulatively add to fine-sediment mobilization into area creeks. Water depletions could also negatively

impact aquatic habitats. Given that most of the trout-occupied habitats occur within headwaters of area creeks, the continued development of natural gas in the lower elevations of the basin would not be coincidental to most trout habitats. However, some natural gas pads may indeed occur higher in trout-occupied basins, which may cumulatively have negative impacts to water quality and habitats through fine-sediment delivery and possibly chemical contaminants. Other reasonably foreseeable activities on National Forest System lands would require Section 7 consultation with the USFWS.

**Alternative 1** – Direct and indirect impacts to aquatic wildlife would be the same as for the Proposed Action. Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to aquatic wildlife. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The types of cumulative impacts to aquatic wildlife from the implementation of Alternative 1 in combination with the No Action Alternative would be the same as for the Proposed Action. However, Alternative 1 would have 3.3 fewer miles of new or improved access roads and 6 fewer miles of pipelines than the Proposed Action, proportionately reducing related impacts during construction and production.

**No Action Alternative** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would develop up to 55 new wells on 11 well pads on fee surface and would add up to 11 wells to existing well pads. The No Action Alternative would have the same number of pipeline crossings of fish-bearing streams as the Proposed Action, including Roberts Creek and East Muddy Creek. Ault Creek would also be crossed with an improved roadway, and mitigation measures for fish would be included in that crossing (the same as under the Proposed Action). Under the No Action Alternative, there would be decreased water depletions from the Ault Creek and East Muddy Creek drainages, due to the reduced need for water. See the sections on Water Quality, Surface and Ground; Threatened, Endangered, and Sensitive Species; and Wetlands and Riparian Zones for more information. For detailed analyses, see the Biological Evaluation (Pettersen 2012).

**Finding on the Public Land Health Standard for Plant and Animal Communities** (partial, see also Vegetation; Wildlife, Terrestrial; and Invasive, Non-native Species): Based on the Land Health Assessment for the North Fork Landscape (BLM 2007), the main issues regarding aquatic wildlife communities with potential cumulative impacts from this project are associated with deposition of fine sediments into aquatic habitats, water diversions and reductions in instream flows, noxious weed invasions of riparian communities throughout the North Fork valley, poor water quality of irrigation return flows, and low water temperatures due to water releases from larger reservoirs (i.e., Aspinall Unit). On BLM lands within the Unit, the alignment of the Spring Creek Trail and its use as a stock driveway and OHV trail is causing erosion and deposition of fine sediments into wetland and riparian habitats. The Proposed Action would see a pipeline route and new access road crossing BLM lands that has existing negative impacts to aquatic habitats associated with the Spring Creek Trail. Aggressive and timely treatment of noxious weeds would help riparian and wetland habitat conditions. Use of native wetland plants for reclamation of wetlands areas, as proposed, would allow for rapid recovery and function of wetland and riparian habitats. Robust stormwater management and timely and effective use of BMPs would help reduce fine sediment deposition into aquatic habitats. Required documentation of BMP use would help ensure that BMPs are timely and effective. Livestock exclosures may be necessary around wetlands and riparian areas to ensure that revegetation efforts are successful. The temporary storage and recycling of flowback waters and use of produced water for hydraulic fracturing would help reduce the need for and amount of use of fresh surface waters. Based on the protective stipulations listed, the Proposed Action, Alternative 1, and No Action would not jeopardize the viability of any aquatic vertebrate species. The project would not greatly impact habitat condition, utility, or function or have discernible adverse effects on species abundance or distribution at any landscape scale. Public land health standard 2, 3 and 5 (partial) would continue to be met.

## WETLANDS AND RIPARIAN ZONES (includes a finding on Standard 2)

**Affected Environment** – Jurisdictional wetlands, which are hydrologically connected to Waters of the U.S., are found throughout the Bull Mountain Unit (see Figure 9, Vegetation). Major drainages include Lee Creek and East and West Muddy Creeks. Wetlands in the Unit are dominated by beaked sedge (*Carex utriculata*), woolly sedge (*Carex lanuginosa*), meadow sedge, swordleaf rush (*Juncus ensifolius*), Baltic rush (*Juncus balticus*) and other graminoids. Rocky Mountain willow (*Salix monticola*), Bebb's willow (*S. bebbiana*), and Drummonds willow (*S. drummondiana*) occur in these wetlands. Most wetlands retain moisture well into the summer, and the widespread irrigation at the northern end of the Unit has definitely expanded the surface area of wetlands. Subsequently, many irrigation ditches and laterals move waters across the private ranches, utilizing waters from Lee, Henderson, Spring, Drift, Little Henderson, Grouse, Buck, East and West Muddy, and Ault creeks. Widespread summertime cattle and sheep grazing has impacted these wetlands; hoof action on soft soils is evident and extensive grazing of wetland vegetation was observed during 2008 – 2011 site visits. Hedging of willows was also evident.

No fens have been identified within the Unit.

Using aerial photograph interpretation and wetland delineations (USACE 1987, 2008) approximately 1,981 acres of irrigated meadows, 671.8 acres of wetland/riparian systems, and 16.1 acres of willows were mapped in the Unit.

### Environmental Consequences/Mitigation:

**Proposed Action** – Many of the proposed well pads would be located within or at the edges of irrigated pastures due to the relatively level terrain, and desires of landowners. While irrigated pastures are not always considered a Water of the U.S., many of the pastures do support isolated features which would fall under the jurisdiction of the USACE. As part of the GIS modeling process in siting pads, higher preference was given to sites further than 300 feet from wetlands, and any road or pipeline crossing was planned to minimize impacts to the extent practicable to wetland resources. Table 36 summarizes the level of impacts to wetlands from the Proposed Action.

**Table 36. Impacts to Wetlands, Proposed Action**

Vegetation Type	Existing Conditions		Proposed Temporary		Proposed Permanent	
	Acres	% of Unit	Acres	% of Unit	Acres	% of Unit
Irrigated Meadow	1,981.0	69.6%	12.7	0.4%	4.1	0.1%
Riparian Woodland	87.3	3.1%	0.5	0.0%	0.1	0.0%
Wetland/Riparian Area	671.8	23.6%	3.1	0.1%	1.3	0.0%
Willow	16.1	0.6%	0.0	0.0%	0.0	0.0%
Open Water	88.8	3.1%	0.3	0.0%	0.0	0.0%
<b>Total</b>	<b>2,845.0</b>	<b>100.0%</b>	<b>16.6</b>	<b>0.5%</b>	<b>5.5</b>	<b>0.1%</b>

Under the Proposed Action there would be 5 pipeline crossings of perennial streams, 4 new road crossings of perennial streams, and 3 upgraded stream crossings. No pads would be located within known wetland areas, but final pad layout and design would occur during the APD process. No pads would be located within a jurisdictional wetland (per USACE).

Any direct impact to jurisdictional wetlands would require permitting through the USACE for compliance with section 404 of the Clean Water Act. Indirect impacts to wetlands could occur, despite best efforts to maintain Best Management Practices and applicant-committed mitigation. The primary possible effect to wetlands would be the increased delivery of fine sediments from cut-and-fill slopes and road surfaces washing down into wetland areas during intense thunderstorm events, or warm spring snowmelt events. There would also be a possibility of accidental spills of chemicals including diesel, produced water, hydraulic fracturing fluids, acids, and other previously listed substances which could be washed into

wetlands. As part of CDPHE permitting, the operator is required to report and clean up any spills. Operator-committed mitigation measures to protect wetland and aquatic resources are listed under the Proposed Action.

The impact of increased fine sediments would include the smothering of vegetation, which could reduce plant diversity in wetland areas. There is already fine sediment delivery to many of the wetlands in the Unit due to livestock grazing and road runoff; therefore, impacts to wetland vegetation have already occurred to some degree. Fine sediments could also decrease pool depths, smother egg masses for amphibians, and reduce aquatic macroinvertebrate diversity. The degree to which these effects would be noticed would depend on the amount and duration. Spilled chemicals would likely decrease aquatic macroinvertebrate diversity, and could produce localized die-offs of amphibians which occur downstream of pad sites. The extent and level of potential impacts from spills would be dependent on what is spilled, how much is spilled, and the success and timeliness of cleanup efforts.

Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to wetlands and riparian areas. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The cumulative impacts assessment area for wetlands includes the Bull Mountain Unit and surrounding lands. Combined temporary impacts to wetlands under the Proposed Action plus the No Action Alternative would total 45.3 acres, plus 10.2 acres of permanent impacts. Temporary and permanent impacts would occur mostly within irrigated meadows, which may not be jurisdictional wetlands.

The ongoing use and foreseeable increased use of roads within and around the Unit for natural gas development as well as recreation would increase the mobilization and availability of fine sediments that could wash into wetlands. In gas fields, roads are by far the highest sources of fine-sediment delivery to wetland and aquatic resources.

Other impacts to wetlands include livestock grazing. Cattle often congregate in wetland areas for shade and forage as well as water. In local stream studies (RMES 2009, Petterson 2012), cattle grazing was cited as a high contributor to fine-sediment mobilization, bank destabilization, and negative impacts to wetland resources.

Water depletions in and around the Unit could also cause indirect impacts to wetlands through drying of wetland resources. As most of the perennial creeks within the Unit are diverted for hay production, instream aquatic habitats, functionality, and riparian systems are negatively impacted through decreased available instream flows.

**Alternative 1** – The types of impacts to wetlands would be similar to those for the Proposed Action. Table 37 summarizes impacts to wetlands under Alternative 1.

**Table 37. Impacts to Wetlands, Alternative 1**

Vegetation Type	Existing Conditions		Construction		Production	
	<i>Acres</i>	<i>% of Unit</i>	<i>Acres</i>	<i>% of Unit</i>	<i>Acres</i>	<i>% of Unit</i>
Irrigated Meadow	1,981.0	69.6%	16.4	0.6%	6.3	0.2%
Riparian Woodland	87.3	3.1%	0.5	0.0%	0.1	0.0%
Wetland/Riparian Area	671.8	23.6%	2.4	0.1%	1.1	0.0%
Willow	16.1	0.6%	0.0	0.0%	0.0	0.0%
Open Water	88.8	3.1%	0.1	0.0%	0.0	0.0%
<b>Total</b>	<b>2,845.0</b>	<b>100.0%</b>	<b>19.4</b>	<b>0.7%</b>	<b>7.5</b>	<b>0.2%</b>

Under Alternative 1 there would be 5 pipeline crossings of perennial streams, 3 new road crossings of perennial streams, and 1 upgraded stream crossing. No pads would be located within known wetland areas, but final pad layout and design would occur during the APD process. No pads would be located

within a jurisdictional wetland (per USACE). Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to wetlands and riparian areas. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The types of cumulative impacts to wetlands from the implementation of Alternative 1 in combination with the No Action Alternative would be the same as for the Proposed Action. There would be 232.1 acres of temporary impacts during construction, an increase of 186.8 acres as compared to the Proposed Action, and 80.1 acres of permanent impacts, an increase of 69.9 acres as compared to the Proposed Action. These increased impacts would result from more of the Unit development being clustered in irrigated meadows.

**No Action Alternative** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would develop up to 55 new wells on 11 well pads on fee surface and would add up to 11 wells to existing well pads. The level of impacts to wetlands are summarized in Table 38. The pad siting process, and types of impacts to wetlands would be the same as for the Proposed Action.

**Table 38. Impacts to Wetlands, No Action**

Vegetation Type	Existing Conditions		Construction		Production	
	<i>Acres</i>	<i>% of Unit</i>	<i>Acres</i>	<i>% of Unit</i>	<i>Acres</i>	<i>% of Unit</i>
Irrigated Meadow	1,981.0	69.6%	27.5	1.0%	4.2	0.1%
Riparian Woodland	87.3	3.1%	0.0	0.0%	0.0	0.0%
Wetland/Riparian Area	671.8	23.6%	1.1	0.0%	0.4	0.0%
Willow	16.1	0.6%	0.0	0.0%	0.0	0.0%
Open Water	88.8	3.1%	0.1	0.0%	0.0	0.0%
<b>Total</b>	<b>2,845.0</b>	<b>100.0%</b>	<b>28.7</b>	<b>1.0%</b>	<b>4.6</b>	<b>0.1%</b>

Under the No Action Alternative there would 4 pipeline crossings of perennial streams, 1 new road crossings of perennial streams, and 1 upgraded stream crossing. No pads would be located within known wetland areas, but final pad layout and design would occur during the APD process. No pads would be located within a jurisdictional wetland (per USACE).

**Finding on the Public Land Health Standard for Riparian Systems:** Based on the Land Health Assessment for the North Fork Landscape (BLM 2007), the main issues regarding riparian systems with potential cumulative impacts from this project are associated with water diversions, livestock grazing, reductions in instream flows, and noxious weed invasions of riparian communities throughout the North Fork valley. On BLM lands within the Unit, the Spring Creek Trail and its use as a stock driveway and OHV trail, and its current alignment is causing erosion and negative impacts to riparian habitats. The Proposed Action would see a pipeline route and new access road crossing BLM lands that has existing negative impacts to riparian systems associated with the Spring Creek Trail. While the Proposed Action and Alternative 1 should have no direct impact to wetland systems beyond what is permitted, accidental spills could occur. Further, despite installation of BMPs, failure of BMPs may occur due to neglect or intense thunderstorm or spring snowmelt events. Any of these unplanned events may have localized detrimental impacts to wetland systems. However, the Operator is required to remedy any BMP failures or accidental spills, so impacts to wetlands from accidents or neglect would likely be short-term. The Proposed Action, Alternative 1, and No Action Alternative should have negligible impact on riparian systems and wetlands given the small scale of the project, the COAs which include installation and monitoring of BMPs, required remediation for accidental spills or failure of BMPs, and required on-site mitigation through section 404 of the Clean Water Act, as administered by the USACE and EPA. The public land health standard would continue to be met.

## FLOODPLAINS

**Affected Environment:** No floodplains have been identified within the Unit.

## WATER QUALITY, SURFACE AND GROUND (includes a finding on Standard 5)

**Affected Environment: Surface Water:** The Unit falls within the North Fork Gunnison River drainage basin, USGS Hydrologic Unit Code (HUC) 1402004, with a drainage area of approximately 969 square miles. Surface water features within the Unit include portions of 12 perennial streams, numerous intermittent streams, manmade reservoirs, and at least 19 springs (Figure 10). East and West Muddy creeks reach their confluence just south of the Unit, where they join to form Muddy Creek. The Unit is within the Colorado River basin.

Peak runoff within the area is a result of spring (April through June) snowmelt runoff (Table 39). The perennial and intermittent channels within the Unit typically have steep gradients. Remnants of the Wasatch Formation, which is present in the upper North Fork watershed, are loosely consolidated and highly erosive and likely produce naturally high sediment loads in the North Fork Gunnison River (NFRFA 2010).

**Table 39. Typical Monthly Flows for USGS Gauges near the Unit (cfs<sup>1</sup>)**

Stream Gage Site (USGS Gage # and Name)	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
09131200 West Muddy Creek Near Somerset, Co	5.0	5.1	9.9	64.7	166.8	74.7	14.5	6.3	8.7	8.5	7.4	5.7
09130500 East Muddy Creek Near Bardine, Co	13.7	14.8	26.1	172.8	474.9	209.3	46.6	27.1	18.9	18.5	18.4	15.0
09131500 Muddy Creek at Bardine, Co	21.0	22.4	29.9	302.3	642.1	268.7	48.7	36.0	22.4	24.0	24.0	21.0

<sup>1</sup> Cubic feet per second

Source: USGS National Water Information System (<http://wdr.water.usgs.gov/nwisgmap/>)

One hundred twelve (112) ponds/reservoirs were located within the Unit, as determined from the Bull Mountain and Chair Mountain United States Geological Survey (USGS) 7.5-minute topographic quadrangle maps and 2009 National Agriculture Imagery Program (NAIP). Of this total, 19 were permitted through the Colorado Division of Water Resources (CDWR). The permitted reservoirs have various uses, including recreation, fishery, augmentation, fire, stock federal reserve, other uses, and wildlife (CDWR 2010). Permitted reservoirs are summarized in the Water Resources Technical Report (WWC 2011).

No springs are identified on USGS quadrangle maps within the Unit, but six spring sites are listed in the National Water Information System (NWIS) database and 13 are recorded as surface water rights in the CDWR database (including two that were also in the NWIS database). All spring locations are shown on Figure 10. No flowing wells have been identified within the Unit. Available water quality data for the six NWIS database springs are included in Table 40 (USGS 2010b).



**Table 40. General Water Quality of Springs within the Unit (one sample per station)**

Gauging Station	Parameters		
	Temperature (°F)	Specific Conductance (µmohs/cm)	pH (standard units)
USGS 390210107202001 SC01208909ABB1	57	70	6.9
USGS 390340107213801 SC01108932BAD1	50	205	8.2
USGS 390435107253801 SC01109027AAC1	82	285	7.5
USGS 390611107235601 SC01109013BDB1	68	320	7.2
USGS 390625107231701 SC01109013AAA1	61	270	7.0
USGS 390659107240801 SC01109012BCA1	46	370	6.7

Source: USGS National Water Information System – Water Quality Samples for Colorado.  
[http://nwis.waterdata.usgs.gov/co/nwis/qwdata?search\\_criteria=search\\_site\\_no&submitted\\_form=introduction](http://nwis.waterdata.usgs.gov/co/nwis/qwdata?search_criteria=search_site_no&submitted_form=introduction)

As noted above, East and West Muddy creeks are tributaries to the North Fork Gunnison River, which flows into the Gunnison River, and the Gunnison River ultimately flows into the Colorado River. The Colorado Department of Public Health and Environment (CDPHE) regulations governing the North Fork Gunnison River are contained within Water Quality Control Commission (WQCC) Regulation No. 35. WQCC Regulation No. 35 establishes classifications and numeric standards for the Gunnison and Lower Delores River Basins (CDPHE 2010a).

Colorado has adopted basic standards and antidegradation rules for surface waters. Under these rules, all tributaries to the North Fork Gunnison River (including all lakes, reservoirs, and wetlands) are classified under five separate categories. Colorado further defines each classification by designating a use for each class of water and assigning numeric or narrative water quality standards to protect the assigned use. The classified uses for surface water are Aquatic Life; Recreation; Domestic Water Supply; Wetlands; and Agriculture (CDPHE 2009a). The classifications are as follows:

#### Aquatic Life

- Class I - Cold Water Aquatic Life - These are waters that (1) currently are capable of sustaining a wide variety of cold water biota, including sensitive species, or (2) could sustain such biota but for correctable water quality conditions. Waters shall be considered capable of sustaining such biota where physical habitat, water flows or levels, and water quality conditions result in no substantial impairment of the abundance and diversity of species.
- Class 1 - Warm Water Aquatic Life - These are waters that (1) currently are capable of sustaining a wide variety of warm water biota, including sensitive species, or (2) could sustain such biota but for correctable water quality conditions. Waters shall be considered capable of sustaining such biota where physical habitat, water flows or levels, and water quality conditions result in no substantial impairment of the abundance and diversity of species.
- Class 2 - Cold and Warm Water Aquatic Life - These are waters that are not capable of sustaining a wide variety of cold or warm water biota, including sensitive species, due to physical habitat, water flows or levels, or uncorrectable water quality conditions that result in substantial impairment of the abundance and diversity of species.

### Recreation

- Class E - Existing Primary Contact Use: These surface waters are used for primary contact recreation or have been used for such activities since November 28, 1975.
- Class P - Potential Primary Contact Use - These surface waters have the potential to be used for primary contact recreation. This classification shall be assigned to water segments for which no use attainability analysis has been performed demonstrating that a recreation class N classification is appropriate, if a reasonable level of inquiry has failed to identify any existing primary contact uses of the water segment, or where the conclusion of a UAA is that primary contact uses may occur in the segment, but there are no existing primary contact uses.
- Class N - Not Primary Contact Use - These surface waters are not suitable or intended to become suitable for primary contact recreation uses. This classification shall be applied only where a use attainability analysis demonstrates that there is not a reasonable likelihood that primary contact uses will occur in the water segment(s) in question within the next 20-year period.
- Class U - Undetermined Use - These are surface waters whose quality is to be protected at the same level as existing primary contact use waters, but for which there has not been a reasonable level of inquiry about existing recreational uses and no recreation use attainability analysis has been completed. This shall be the default classification until inquiry or analysis demonstrates that another classification is appropriate.

### Domestic Water Supply

- These surface waters are suitable or intended to become suitable for potable water supplies. After receiving standard treatment (defined as coagulation, flocculation, sedimentation, filtration, or disinfection with chlorine or its equivalent), these waters will meet Colorado drinking water regulations and any revisions, amendments, or supplements thereto.

### Wetlands (The provisions of this section do not apply to constructed wetlands.)

- Compensatory wetlands shall have, as a minimum, the classifications of the segment in which they are located.
- Created wetlands shall be considered to be initially unclassified, and shall be subject only to the narrative standards set forth in section 31.11, unless and until the Commission adopts the “wetlands” classification described below and appropriate numeric standards for such wetlands.
- Tributary wetlands shall be considered tributaries of the surface water segment to which they are most directly connected and shall be subject to interim classifications as follows: such wetlands shall be considered to have the same classifications, except for drinking water supply classifications, as the segment of which they are a part, unless the “wetlands” classification and appropriate site-specific standards have been adopted to protect the water quality dependent functions of the wetlands. Interim numeric standards for these wetlands are described in section 31.7(1)(b)(iv).



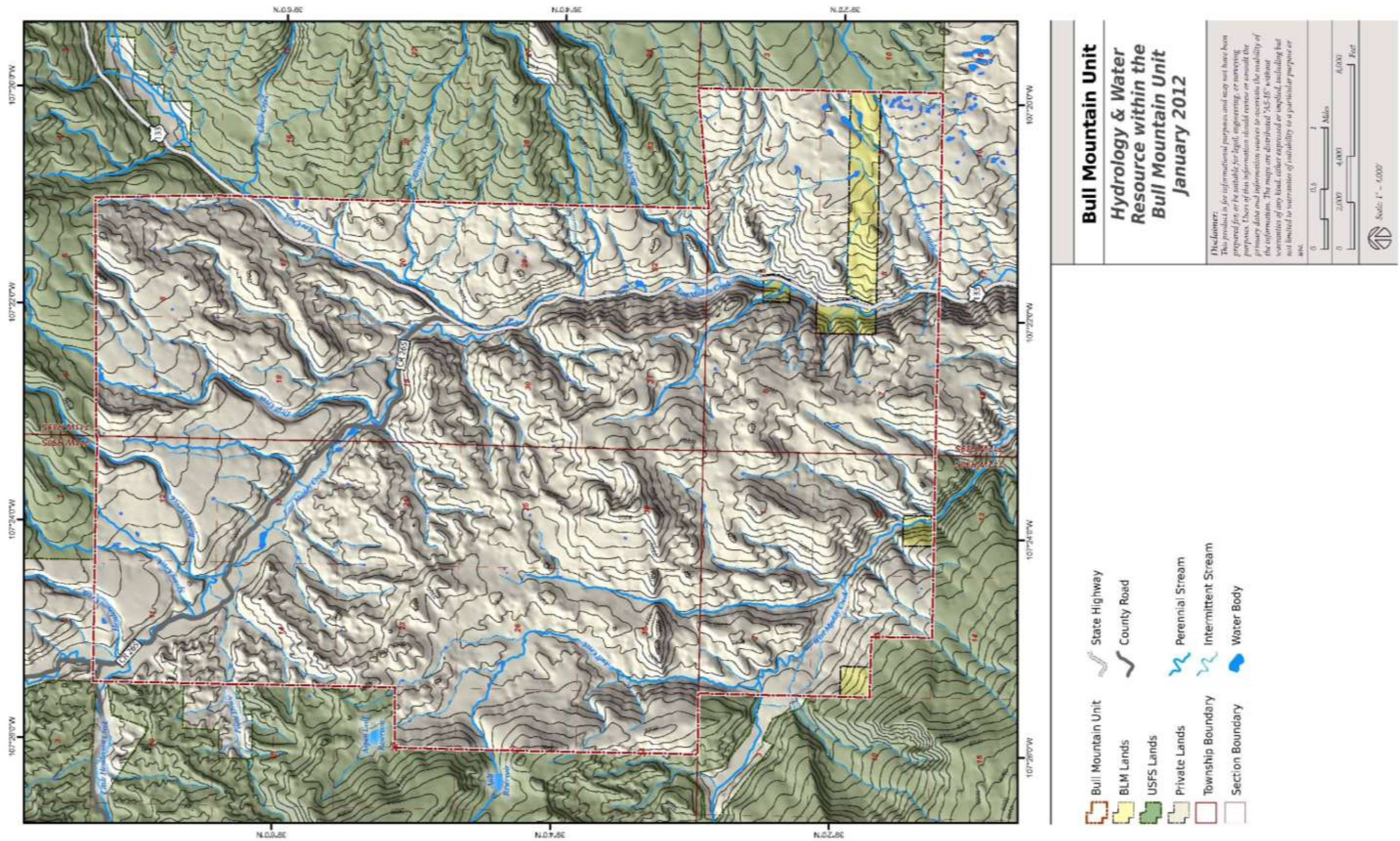


Figure 10. Hydrology and Water Resource within the Bull Mountain Unit



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- The Commission may adopt a “wetlands” classification based on the functions of the wetlands in question. This classification would be the same as that used by both EPA and the USACE. Wetland functions that may warrant site-specific protection include ground water recharge or discharge, flood flow alteration, sediment stabilization, sediment or other pollutant retention, nutrient removal or transformation, biological diversity or uniqueness, wildlife diversity or abundance, aquatic life diversity or abundance, and recreation. Because some wetland functions may be mutually exclusive (e.g., wildlife abundance, recreation), the functions to be protected or restored will be determined on a wetland-by-wetland basis, considering natural wetland characteristics and overall benefits to the watershed. The initial adoption of a site-specific wetlands classification and related standards to replace the interim classifications and standards described above shall not be considered a downgrading.

#### Agriculture

- These surface waters are suitable or intended to become suitable for irrigation of crops usually grown in Colorado and which are not hazardous as drinking water for livestock.

Stream segment descriptions and water quality classifications within and downstream of the Unit, including the North Fork Gunnison River, are provided in Table 41. A complete listing of numeric standards for physical, biological, inorganic, and metal parameters for Colorado surface water can be found in Basic Standards for Surface Water (CDPHE 2009a).

**Table 41. Stream Classifications and Water Quality Standards**

<b>Stream Segment Description</b>	<b>Classification</b>
1. All tributaries to North Fork of the Gunnison River including all lakes, reservoirs, and wetlands within the West Elk and Raggeds Wilderness Areas.	Aquatic Life Cold 1 Recreation E Water Supply Agriculture
2. Mainstem of North Fork of the Gunnison River from the confluence of Muddy Creek and Coal Creek to the Black Bridge (41.75 Drive) above Paonia.	Aquatic Life Cold 1 Recreation E Water Supply Agriculture
3. Mainstem of North Fork of the Gunnison River from the Black Bridge (41.75 Drive) above Paonia to the confluence with the Gunnison River.	Aquatic Life Cold 1 Agriculture Oct. 1 to March 31 Recreation N April 1 to Sept. 30 Recreation E
4. All tributaries to the North Fork of the Gunnison River including all lakes, reservoirs, and wetlands from the source of Muddy Creek to a point immediately below the confluence with Coal Creek; all tributaries to the North Fork of the Gunnison including all lakes, reservoirs, and wetlands, including the Grand Mesa Lakes which are on National Forest lands, except for the specific listing in Segments 1 and 7.	Aquatic Life Cold 1 Recreation E Water Supply Agriculture
6a. All tributaries to the North Fork of the Gunnison River including all lakes, reservoirs, and wetlands which are not on National Forest lands, except for the specific listings in Segments 4, 5, 6b and 7.	Aquatic Life Warm 2 Recreation P Agriculture
7. Paonia Reservoir.	Aquatic Life Cold 1 Recreation E Water Supply Agriculture

Regulation No. 93 is Colorado's Section 303(d) list of water quality limited segments requiring total maximum daily loads (TMDLs) (CDPHE 2010b). The 2010 303(d) list of segments needing the TMDLs includes one segment within the North Fork Gunnison River (from Black Bridge above Paonia to the confluence with the Gunnison River), which is listed as impaired due to selenium. This segment is downstream of the Unit and is the only stream segment on the mainstem of the North Fork Gunnison River drainage on the State's Section 303(d) list. Regulation 35 designates Segment 6a of the North Fork Gunnison River as use-protected with numeric standards that protect existing aquatic life (CDPHE 2010a).

Surface water quality in semi-arid regions is typically seasonally variable and dependent on the magnitude and frequency of discharge events. Approximately 80% of Colorado's water supply comes from melting snow (NFRIA 2010). Due to the erosive nature of the area soils, relatively high suspended sediment concentrations are expected, particularly during high-flow events. Intermittent streams in the area commonly exhibit very high suspended sediment concentrations during the first flows of a flood wave, apparently the result of a flushing action. During periods of several months or more without flow, basin surfaces and stream channels accumulate loose material due to weathering, wildlife and livestock movements, bank caving, and wind deposits. These loose materials are then readily picked up and transported (flushed) by the turbulent first flows of a flood wave. Once the initial flush has occurred, the amount of sediment transported is dependent upon supply and magnitude of discharge (Lowham et al. 1982). The amount of runoff from intermittent streams may be small in relation to that of the larger perennial receiving streams (i.e., East and West Muddy creeks, Muddy Creek, and North Fork Gunnison River), although the flushing process results in relatively large concentrations of dissolved and suspended materials that may constitute a shock load to receiving streams, particularly during low-flow summer months. Runoff from arid and semi-arid areas can therefore have a significant influence on the water quality of the perennial streams receiving such runoff (Lowham et al. 1982).

During periods of extensive runoff due to thunderstorms and snowmelt, water within East and West Muddy creeks generally has lower levels of sodium, bicarbonate, calcium, and magnesium. Sulfate and potassium levels also decrease slightly during snowmelt events (USGS 2010b). During the irrigation season, sodium becomes more concentrated and calcium and magnesium concentrations also increase (USGS 2010b).

One USGS surface water quality sampling station (390620107241900) is located within the Unit, and four other sampling stations (09129800, 390000107212700, 385918107205200, and 385903107210800) are located either above or below the Unit that provided relevant long-term water quality data. Temperature, specific conductance, pH, hardness (as  $\text{CaCO}_3$ ), SAR, dissolved solids, suspended sediments, and sediment yield are the parameters evaluated, as they are typically indicators for the evaluation of water for various uses.

The USGS has collected water quality samples of various constituents at differing time intervals. Data are available on the USGS website (USGS 2010b) and are summarized in Table 42. These data show that water quality generally decreases in the downstream direction. For example, the average annual total dissolved solids (TDS) concentration ranged from approximately 101 milligrams per liter (mg/L) at the upper stream station (USGS 09129800) to approximately 146 mg/L at the lower station (USGS 390620107241900). Natural erosion of geologic units is the primary source of dissolved solids.

Moderately erosive and saline soils naturally occur within and around the Unit. Once the soil is disturbed (i.e., from construction of a road or well pad), the potential for the release of residual soil sediment is increased. It is possible that oil and gas activities in the general area have contributed, and will continue to contribute, to both sedimentation and salinity levels presently being experienced in the Colorado River. All of the soils within the Unit have the potential to create water quality-related sediment and salinity problems when disturbed.

**Table 42. General Water Quality of East Muddy/Muddy Creeks on Near the Unit**

Parameter	No. of Samples	Range	Mean	Median
USGS 09129800 Clear Fork Near Ragged Mountain, CO (1965 – 1973)				
Temperature (°C)	83	0-22.0	8.2	7.0
Specific Conductance (µmohs/cm)	10	82-230	153.0	146.5
pH (field - standard units)	10	8.0-8.6	8.3	8.3
Total Hardness (mg/L as CaCO <sub>3</sub> )	9	40-120	80	75
SAR (unitless)	9	0.2-0.3	0.2	0.2
Total Dissolved Solids @ 180 °C (mg/L)	7	61-147	100.7	95.0
Total Suspended Solids (mg/L)	10	4-641	88.1	15.5
Sediment Yield (tons/day)	10	0.05-701	76.7	1.3
USGS 385903107210800 Muddy Creek Above Paonia Reservoir, CO (1982 – 1983)				
Temperature (°C)	15	6.5-20	13.5	13.0
Specific Conductance (µmohs/cm)	15	120-305	191.5	180.0
pH (standard units)	15	7.6-8.7	8.2	8.2
Total Hardness (mg/L as CaCO <sub>3</sub> )	15	60-140	90.1	79.0
SAR (unitless)	15	0.2-0.4	0.3	0.3
Total Dissolved Solids @ 180 °C (mg/L)	14	84-182	124.4	117.5
Total Suspended Solids (mg/L)	10	58-3,660	862.3	450.5
Sediment Yield (tons/day)	10	9.4-3,710	1395.1	905.0
USGS 385918107205200 Muddy Creek Above Paonia Res Site No 1 (1977 – 1978)				
Temperature (°C)	2	6.5-20	0.2	0.2
Specific Conductance (µmohs/cm)	2	120-305	302.5	302.5
pH (standard units)	2	7.6-8.7	8.3	8.3
Total Hardness (mg/L as CaCO <sub>3</sub> )	--	--	--	--
SAR (unitless)	2	7.3-8.5	140.0	140.0
Total Dissolved Solids @ 180 °C (mg/L)	2	60-140	0.4	0.4
Total Suspended Solids (mg/L)	--	--	--	--
Sediment Yield (tons/day)	--	--	--	--
USGS 390000107212700 Lower West Muddy Creek Near Paonia Reservoir, CO (1982 – 1983)				
Temperature (°C)	12	9.0-23	15.7	17.0
Specific Conductance (µmohs/cm)	12	145-374	250.6	247.5
pH (standard units)	12	7.8-8.9	8.4	8.3
Total Hardness (mg/L as CaCO <sub>3</sub> )	12	68-180	120.3	125.0
SAR (unitless)	12	0.2-0.4	0.3	0.3
Total Dissolved Solids @ 180 °C (mg/L)	12	936-210	152.8	155.5
Total Suspended Solids (mg/L)	11	10-271	96.6	48.0
Sediment Yield (tons/day)	11	0.15-653	110.5	6.4
USGS 390620107241900 East Muddy Creek Near Ragged Mountain, CO (1982 – 1983)				
Temperature (°C)	13	5.5-19.5	13.7	14.5
Specific Conductance (µmohs/cm)	13	110-406	228.5	180.0
pH (standard units)	13	7.8-8.8	8.2	8.2
Total Hardness (mg/L as CaCO <sub>3</sub> )	13	56-180	105.8	78.0
SAR (unitless)	13	0.2-0.7	0.4	0.4
Total Dissolved Solids @ 180 °C (mg/L)	11	77-233	145.6	105.0
Total Suspended Solids (mg/L)	11	33-5,790	1216.5	657.0
Sediment Yield (tons/day)	11	5.5-1,350	518.9	95.0



The North Fork is recognized as a major contributor of salt to the Colorado River System (NFRIA 2010). Salinity has become a major concern within the Colorado River drainage basin. The 1972 Clean Water Act required the establishment of numeric criteria for salinity for the Colorado River and in 1973, seven Colorado River Basin states created the Colorado River Basin Salinity Control Forum. The Forum developed water quality standards for salinity including numeric criteria and a basin-wide plan of implementation. The plan consists of a number of control measures to be implemented by State and Federal agencies. In 1974, Congress enacted the Colorado River Basin Salinity Control Act. The Act was amended in 1984, requiring the Secretary of the Interior to develop a comprehensive program to minimize contributions from lands administered by the BLM.

To date, there are no current salinity evaluations of the North Fork watershed or Gunnison basin (NFRIA 2010). USGS information characterizing salinity of the Gunnison River indicated that long-term (1931 through 2011) TDS values fluctuated between 166 and 2,820 mg/L and there has been a significant decline in average annual TDS values over time (USGS 2011).

### Groundwater

Groundwater quality is largely related to the depth of the respective source aquifer, flow between aquifers, and the rock type. Temperature, specific conductance, pH, hardness (as CaCO<sub>3</sub>), SAR, dissolved solids, suspended sediments, and sediment yield are the parameters evaluated below, as they are typically indicators for the evaluation of water for various uses.

Aquifers of the North Fork Gunnison River basin are found in the alluvium and bedrock. Most wells in the North Fork basin are at altitudes below 7,500 feet and yield from 2 to 40 gallons per minute. The wells are often located in alluvial sand and gravel, sandstone, or fractured bedrock. Springs generally are at altitudes above 7,000 feet, discharge from perched water tables at geologic contacts, have calcium magnesium bicarbonate water types, and are much less saline than water from wells (NFRIA 2010).

A USGS investigation of groundwater resources in the North Fork watershed found that alluvial aquifers yield water with dissolved solids concentrations ranging from 43 to 2,300 mg/L. Dissolved solids concentrations of water samples from the Mesaverde Group, the Dakota Sandstone, and Burro Canyon Formation ranged from 56 to 3,200 mg/L. Dissolved solids concentrations of water samples from the Mancos Shale ranged from 1,800 to 8,200 mg/L (Ackerman and Brooks 1986).

According to the North Fork River Watershed Plan, groundwater from bedrock aquifers in the upper watershed is generally of the sodium bicarbonate type that is neutral to alkaline (pH 7-9), with low metals content and high methane content. Dissolved solids in the bedrock units are in the general range of 1,000 to 2,500 mg/L, with the exception of the Rollins Sandstone, which is between 3,000 and 9,000 mg/L (NFRIA 2010).

SG's existing disposal well (Federal 24-2 WDW) is a Class II disposal well located on fee lands in the NWSW Section 24, T11S, R90W and is used to dispose of produced water from current natural gas production in the area. The geological horizons for the primary disposal zones for the one existing and four proposed disposal wells are the Dakota Sandstone, Morrison Formation, Entrada Sandstone, or Maroon Formation at depths between 9,300 and 9,500 feet. The TDS concentration measured in the existing injection well, completed in the Unit in the Permo-Pennsylvanian age Maroon Formation, is 18,962 mg/L. Using USGS salinity classification (Heath, 1983) this water is described as very saline. The quality of the water in the other horizons targeted for injections will likely be of similar, poor quality. Produced-water quality sample lab test results from samples collected in 2007 from existing producing wells within the Unit are included in Tables 43 and 44, and indicate organic pollutants (BTEX) from produced water from one existing producing natural gas well within the Unit and the statewide interim organic pollutant standards as identified in CDPHE WQCC Regulation No. 41 (CDPHE 2009b).

**Table 43. Water Quality Lab Test Results from Produced Water From Existing Producing Natural Gas Wells within Producing Formations in the Unit**

Parameter <sup>1</sup>	McIntyre 11-90-14-4	Falcon Seaboard 11-90-12-12-1	Henderson R1	Federal 26-1
pH (Field)	5.5	7.1	5.6	9.6
TDS	10,557	8,775	18,445	4,495
Potassium	94	431	312	110
Sodium	2,961	2,531	5,462	1,493
Calcium	664	260	736	60
Magnesium	252	140	572	60
Bicarbonate	280	636	132	260
Chloride	6,400	4,800	11,600	2,400
Sulfate	0	4	4	19
Total Iron	0.9	5.4	1.6	0.1

<sup>1</sup> All units in mg/L except pH, which is in standard pH units

**Table 44. Water Quality Lab Test Results for Organic Pollutants (BTEX) from Produced Water<sup>1</sup> from an Existing Producing Natural Gas Well within the Unit.**

Location	Contaminant	Result (µg/L)	MCL (µg/L) <sup>2</sup>
Well # 05-051-05004 Section 8 T13S R89W	Benzene	8.1	5
	Ethylbenzene	<2	700
	Toluene	<2	1000
	Xylenes (total)	12.3	10,000

<sup>1</sup> Sample Collected July 25, 2004

<sup>2</sup> Maximum Contaminant Level (CDPHE WQCC Regulation No. 41)

Water to be injected into the disposal wells is first piped into holding tanks to allow sediments to settle out. The water then passes through a series of filters to remove solids larger than 10 microns in diameter. Accumulated solids from the settling and filtration process are periodically removed from the holding tanks and trucked to an approved off-site disposal facility. Chemical treatment of water reduces scaling or deposition of minerals in the receiving formation, which, if unabated, could reduce the porosity in the recovery formation and otherwise shorten the life of the disposal wells. Chemicals used for treatment likely include acids, which keep ions in suspension and retard scaling. Disposal of produced water is in accordance with a plan approved by the BLM as provided for in Onshore Oil and Gas Order No. 7, Disposal of Ground Water, the COGCC rules and regulation (approved by EPA), and the Gunnison County Temporary Regulations for Oil and Gas Operations (Gunnison County Board of County Commissioners 2003).

#### Pre-, During and Post-Project Monitoring

SG currently owns and operates 11 fee/fee and 5 federal natural gas wells on 14 well pads and one water-disposal well within the Bull Mountain Unit. In compliance with Gunnison County and COGCC regulations regarding existing wells and in anticipation of potential new development, SG initiated baseline water quality monitoring of surface water and groundwater (domestic wells intended for human consumption) within the Unit (Gunnison County Board of County Commissioners 2003 and COGCC 2009). Sites have been established to sample surface water along creeks and other water bodies. Samples were also collected from sources of drinking water within a ¼ to 1-mile radius of proposed natural gas wells to establish baseline conditions. SG currently monitors water quality at 75 sites with additional sites added as directed by COGCC and Gunnison County. Sites have been/would be sampled once prior to drilling and would be sampled at year 1, 3, and 5 after well completion. If the project is approved, drilling of new wells (including those on existing pads) would precipitate additional water quality sampling events. The constituents tested and site locations are included in Appendix G.

## **Environmental Consequences/Mitigation:**

**Proposed Action – Surface Water:** Potential impacts to surface water resources include increased turbidity and sedimentation in watercourses, increased short-term runoff, increased salt-loading, contamination of surface water courses and ponds by produced water and petroleum, and depletion of surface water flows in East and West Muddy creeks and possibly the North Fork. Impacts would likely be greatest during the construction and drilling phase, which would disturb approximately 286.9 acres. Production disturbance would total approximately 125.9 acres. Surface water quality could also be affected by the water use requirements of the project.

The magnitude of impacts to surface water resources would depend on several factors, including the proximity of the disturbance to drainages or ponds, slope aspect and gradient, soil type, duration and timing of the construction activity, and the success or failure of mitigation. In an effort to locate potentially suitable sites within the Unit boundary, SG utilized site-suitability models, which combined a number of data sets across a given area to produce a final composite that ranked the appropriateness of a site (Appendix A). The analyses utilized data sets to develop criteria for each site-suitability study, including the following parameters directly or indirectly related to hydrologic function:

- Slope (steepness of the terrain)
- Proximity to existing road networks
- Proximity to existing natural gas pipeline systems
- Proximity to delineated wetlands and wetland buffer zones
- Proximity to stream networks and stream buffer zones
- Soil erosion factors

Construction of access roads, well pads, and pipelines could have temporary to short-term impacts on water quality. Clearing and grading of streambanks, in-stream trenching, and backfilling could affect perennial surface waters through modifications of aquatic habitat, increased sedimentation, increased turbidity, decreased dissolved oxygen concentrations, and releases of chemical and nutrient pollutants from sediments. A reduction in streambank integrity could increase streambank erosion and result in redirection of streamflow. For pipeline crossings, suspended sediment would temporarily increase for the time required to install the pipe in the streambed (typically less than 24 hours). The sediment concentration would progressively decrease downstream as the large sediment particles deposit on the channel bed. Increased salt loading could potentially occur where saline soils would be disturbed and eroded by runoff into streams. Impacts on intermittent streams would be limited to temporary alteration of beds and banks, and possibly increased sediment loads during initial storm events following construction. Pipeline installation at surface water crossings would not permanently alter stream morphology or hydraulic capacity.

Contamination of surface water near oil and gas facilities can occur in oil and gas fields. Sources of potential contamination include leaks from wellheads, conveyance pipelines, compressor stations, produced water sumps (flowback pits), and condensate storage tanks. Leaks from tanker trucks and leaching of contaminants from impacted soils near these facilities are also sources of potential contamination.

Benzene occurs in amounts slightly higher than the statewide interim organic pollutant standards for ground water (Table 45 above). When released directly to surface waters, benzene should evaporate within a few hours. Benzene does not degrade by reacting with water; however, it may be degraded by microbes. Benzene is not likely to accumulate in aquatic organisms (EPA 2010a). Based on a review of the Colorado Division of Water Resources' surface water rights database, designated uses for surface waters within the Unit includes storage, irrigation, industrial, recreation, fishery, fire, domestic, stock, augmentation, federal reserve, other uses, and wildlife (CDWR 2010). Potential health effects resulting from the ingestion of benzene at quantities at or above the Maximum Contaminant Level (MCL) (5 µg/L) include anemia; decrease in blood platelets; increased risk of cancer (EPA 2010b).

Water is needed for a variety of activities associated with development of the Unit, including dust abatement on roads, moistening of soils and gravels for compaction of well pad surfaces, production of drilling muds (to help lubricate the bore hole and circulate drill-bit cuttings), cementing the casing, and hydraulic fracturing and well stimulation. Water is also sometimes used to hydraulically test pipeline integrity. Under the Proposed Action:

- Drilling activities would be completed in just under 6 years. It is estimated that drilling operations (drilling, cementing, and hydraulic fracturing) would use 635 ac-ft per year per year based on three drill rigs drilling an estimated 27 wells per year. Well pad construction would require approximately 29 ac-ft of water per year. The estimated annual water use for the drilling/completion is 664 ac-ft.
- Road/pipeline construction (including 0.5 ac-ft for pressure testing and water for dust abatement and compaction purposes) would require approximately 63 ac-ft of water over the construction phase. For estimation purposes (based on a 6-year drilling schedule) the annual water use for road/pipeline construction would be approximately 11 ac-ft. It is likely that a majority of the road/pipeline construction would be completed ahead of the drilling.
- Total annual water use for construction and drilling operations is estimated to be 675 ac-ft. SG estimated that approximately 70 percent of the water needed for drilling operations could come from recycled hydraulic fracturing fluid or reused produced water, which translates to approximately 203 ac-ft of other water needed for the Bull Mountain GAP project.

Water for drilling and cementing would be pumped to the well site and stored for operations, or would be hauled in by truck. Each well site would have its own procedure for bringing in water, depending on surface-use agreements with local landowners. The water used for the drilling/completion, and additional water for construction (dust abatement and soil compaction) would be considered a “consumptive use” in that the water could not be re-used for other purpose and must be injected into a disposal well, hauled off-site to an approved disposal facility, or allowed to evaporate in a reserve pit. SG plans to re-use drilling fluids where possible due to the expense of disposal and redevelopment of the chemical makeup of the drilling fluids. In order to minimize the consumptive use of water for completion operations, SG is proposing to construct four flowback pits to temporarily store water prior to and after hydraulic fracturing and completion operations (Figure 6).

In June of 2009, HR2766 (Fracturing Responsibility and Awareness of Chemicals Act of 2009) was introduced in Congress to make hydraulic fracturing regulated by the Safe Drinking Water Act (SDWA). It would require the disclosure of the chemical constituents of hydraulic fracturing fluid to the EPA (AIPG 2009). The bill was referred to the House Committee on Energy and Commerce and no action has been taken to date. On December 13, 2011 the State of Colorado enacted 2 Colorado Code of Regulations §404-1:205A, which requires oil and gas operators to disclose on a national public website the chemical ingredients and water volumes used to hydraulically fracture wells within the state. This regulation will apply to wells that undergo hydraulic fracturing treatments on or after April 1, 2012. Additional detail of this regulation is provided in the section on Hazardous and Solid Waste.

COGCC currently has regulations in place to address potential hydraulic fracturing problems. Operators must now notify the COGCC immediately if there are any potential public health problems, and must notify COGCC within 10 days if there are any downhole problems from hydraulic fracturing. A website (<http://fracfocus.org/>) is now available to provide data on hydraulic fracturing chemicals in Colorado. Other requirements include record-keeping and notification of the chemical components of a spill. Operators must maintain Materials Safety Data Sheets (MSDS) for all chemical products. If there is a spill, a letter from the Director of the COGCC is required to obtain details of proprietary chemicals, and while these documents are kept confidential; they are accessible to health professionals if a confidentiality agreement is signed. The COGCC requires bradenhead testing (pressure testing of the annulus between the surface and production casing) to ensure well integrity (AIPG 2009). EPA recently issued voluntary

information requests to leading national and regional hydraulic fracturing service providers. The data requested is integral to the Hydraulic Fracturing Study now underway by EPA, which seeks to understand any potential relationships between hydraulic fracturing and drinking water. EPA is seeking information on the chemical composition of fluids used in the hydraulic fracturing process, data on the impacts of the chemicals on human health and the environment, standard operating procedures at hydraulic fracturing sites, and the locations of sites where hydraulic fracturing has been conducted (EPA 2010c).

In 2009, SG developed a Water Augmentation Plan granted by the District Court – Water Division 4 (Case No. 2009CW16), and regulated through the State Division of Water Resources (Water Division 4) for augmenting approximately 90 ac-ft of water consumptively used from the Muddy Creek basin in order to maintain instream flows. Agricultural waters were re-appropriated for maintaining instream flow requirements under this plan. If necessary, water would be purchased and trucked in from private and/or other sources located near Paonia or Somerset.

Separated, produced water from each producing well would be transported to an approved disposal well within the Unit. SG proposes to develop four additional Class II produced water reinjection (disposal) wells to augment the one existing disposal well (Figure 6). Locations for these new wells were chosen based on the number of gas-producing wells in an area (“pod”), which would be generating water to be reinjected, and on proximity to major road systems to facilitate year-round accessibility. Disposal of produced water would be in accordance with a plan approved by the BLM as provided for in Onshore Oil and Gas Order No. 7, Disposal of Ground Water, COGCC rules and regulation (approved by EPA), and the Gunnison County Temporary Regulations for Oil and Gas Operations.

Approximately 12.2 miles of new access roads and 22.1 miles of new pipelines would be constructed under the Proposed Action, of which approximately 11.4 miles would be co-located with roads. The construction of the new roads and pipelines would result in 17 perennial stream crossings and 41 intermittent stream crossings. The road/pipeline crossings would result in a permanent alteration of channel shape. Due to the flashy nature of these tributaries, the crossings may impact runoff patterns. However, proper design of the crossings to accommodate significantly large flow events would minimize impacts to the drainage. During the construction phase, disturbances associated with the crossings are expected to increase the turbidity, sedimentation, and salt loading within the channels. In the long term, these potential impacts would be minimized as the roadway/pipeline corridors are stabilized by revegetation of the road shoulders and pipeline corridors and paving the road surface, with additional surface disturbances occurring only during major maintenance activities.

Groundwater: Potential impacts to groundwater resources from the Proposed Action include contamination of groundwater with produced water, drilling mud, hydraulic fracturing fluids, or petroleum. Withdrawal of produced water during production activities could impact target aquifers as could reinjection of the produced water.

Alluvial aquifers along East and West Muddy creeks and their tributaries could potentially be contaminated by fluids from the various project components. Soil contamination near these sites, if not remedied quickly, could migrate into the underlying alluvial groundwater and release benzene and other constituents into the groundwater. Domestic, industrial, and irrigation are the present uses for the alluvial groundwater in the Unit. There is the potential for accumulation of organic compounds in the sediment and shallow ground water (perched aquifers) adjacent to the flowback pits. Over the life of the project concentration of these compounds could build to levels significantly higher than state standard MCLs for ground water. Migration of contaminants through soils and perched aquifers to more mobile colluvial/alluvial ground water may occur resulting in contamination of domestic water supplies.

Fracking would be used to stimulate production by increasing the permeability of the producing formation. The hydraulic fracturing fluid, which consists primarily of produced water, is pumped under extremely high pressure downward through the casing and out through the perforations in the casing. Approximately 30,000 bbls (3.87 ac-ft) of hydraulic fracturing fluid per treatment is anticipated. Up to six

treatments may be required per well. The pressurized fluid enters the formation and fractures it. The fractures are typically held open or “propped” by silica sand introduced with the hydraulic fracturing fluid. Following the procedure approximately one-half of the hydraulic fracturing fluid may be returned to the surface where it would be re-used for additional hydraulic fracturing operations during the same season.

SG estimates that at full project build-out between 2,500 and 15,000 bbls per day (118 and 706 ac-ft/year) of produced water would be removed from Mesaverde Group and Mancos Shale aquifers to facilitate the natural gas recovery process. The target depths of the proposed natural gas production wells would vary by well site, but are estimated to be between 5,000 and 10,000 feet. The deepest non-industrial designated-use well within the Unit is 460 feet. Due to the depth separation between SG’s proposed production wells and existing non-industrial use water wells, non-target aquifers in the area should not be impacted by the removal of water resulting from the Proposed Action.

As part of natural gas development in the area, SG intends to install four additional Class II produced-water injection wells for a total of five injection wells associated with the proposed project. All produced water not recycled and reused for drilling/completion operations would be reinjected into these wells. A Class II disposal well, as designated by the Environmental Protection Agency (EPA), is permitted for the purpose of injecting brines and other associated fluids associated with the production of natural gas. A Class II well protects the fresh water resources by injecting and isolating waste fluid in deep formations and eliminating risks associated with its disposal near surface water. Injection wells are under the jurisdiction of the COGCC. According to COGCC Rule 324, injection cannot occur in a non-exempted aquifer. An exempt aquifer must meet the following criteria:

- (1) It does not currently serve as a source of drinking water, and either subparagraph (2) or (3) below apply.
- (2) It cannot now and will not in the future serve as a source of drinking water because:
  - A. It is mineral, hydrocarbon or geothermal energy producing, or can be demonstrated by a person filing an application pursuant to Rule 325, or Rule 401, to contain minerals or hydrocarbons that, considering their quantity and location, are expected to be commercially producible; or
  - B. It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical; or
  - C. It is so contaminated that it would be economically or technologically impractical to render the water fit for human consumption.
- (3) The total dissolved solids content of the ground water is more than three thousand (3,000) and less than ten thousand (10,000) milligrams per liter and it is not reasonably expected to supply a public water system.

The geological horizons for the primary disposal zones for the one existing and four proposed disposal wells are the Dakota Sandstone, Morrison Formation, Entrada Sandstone, or Maroon Formation at depths between 9,300 and 9,500 feet. The TDS concentration measured in the existing injection well, completed in the Unit in the Permo-Pennsylvanian age Maroon Formation, is 18,962 mg/L. The quality of the water in the other horizons targeted for injections will likely be of similar, poor quality. The high TDS concentration in the Maroon Formation in the vicinity of the existing disposal well and the likely similar, poor water quality of the other horizons targeted for injection suggest that these horizons would be classified as exempt aquifers, which would make them suitable for disposal of produced water. SG will demonstrate that the target horizons for injection meet the criteria for an exempt aquifer, per COGCC Rule 324Ba prior to reinjection of produced water. Due to the depth separation between SG’s proposed injection wells and existing non-industrial use water wells (the deepest non-industrial designated use well

within the Unit is 460 feet), non-target aquifers in the area should not be impacted by the Proposed Action.

The potential hazardous contaminant, benzene, in produced water could occur in amounts higher than the statewide interim organic pollutant standards for ground water (see Table 46). When released directly to soils, the contaminants could leach into ground waters. Benzene does not degrade by reacting with water; however, it may be degraded by some soil microbes. Benzene is not likely to accumulate in aquatic organisms. Because the present uses for the alluvial groundwater in the Unit includes domestic uses, potential exists for contamination of potable water. Potential health effects resulting from the ingestion (municipal water uses) of benzene at quantities at or above the MCL (5 µg/L) range from temporary nervous system disorders, immune system depression, and anemia for short term exposures. Long-term exposures at quantities at or above the MCL (5 µg/L) could result in chromosome aberrations and cancer.

Toluene, ethylbenzene, and xylenes also occur in SG's production water. Levels for toluene, ethylbenzene, or total xylenes were well below the assigned MCL levels (Table 45).

A majority of the project facilities are in the areas where no alluvium is present, but several proposed well sites are located on alluvial deposits. In addition, the Wasatch Formation, which crops out and is widely distributed across the Unit, consists of permeable strata and also has some secondary permeability from fractures and jointing and could therefore provide hydraulic communication to the alluvial aquifer.

There is a minor potential for commingling of waters from the aquifers encountered during well construction, if proper well drilling procedures and completion techniques are not employed.

The design and operating specifications for the pipelines that comprise the system are included in the Plan of Development for the project. The trunk pipeline system would consist of several types of pipelines, generally within a shared trench and a shared right-of-way. Portable pipelines would only be utilized for temporary delivery of water for hydraulic fracturing and subsequent flowback waters in areas lacking constructed steel fluid pipelines. This would occur on a case-by-case basis over small distances (less than ¼ mile). Any portable pipelines to federal wells would be covered in the APD process and would only be used during freeze-free periods. Pipeline construction would cross several perennial streams and their alluvial aquifers. Activities such as trenching and backfilling could cause temporary and minor fluctuations in the shallow alluvial groundwater levels and/or increased turbidity within the aquifer immediately adjacent to the construction activity. These effects would subside after trenching and backfilling activities are completed. Dewatering could be required where groundwater accumulates in the pipeline trench. Dewatering would be required to ensure that the pipe is properly fitted and installed into the ditch, minimum cover provided, and the trench bottom is free of rocks and other debris that could damage the external pipe coating. All dewatering would be under the jurisdiction of CDPHE. A Colorado Discharge Permit for construction dewatering is required where the groundwater or commingled water needs to be discharged to surface water or back to the ground (CDPHE 2009c). Impacts from dewatering discharge could result in erosion and sedimentation to upland areas of surface waters in the discharge vicinity. Erosion and sedimentation impacts would be temporary and would be reduced with mitigation.

Under the Proposed Action, approximately 13.5 miles of upgrades to existing two-track roads, and approximately 12.2 miles of new roads would be constructed. The proposed roadways would cross perennial and named and unnamed intermittent tributaries to East and West Muddy creeks. Construction of the roads could alter natural groundwater recharge patterns along the tributaries.

Unintentional leaks from pipelines or water storage vessels associated with the Proposed Action could potentially occur. SG has minimized the potential for shallow groundwater impacts by utilizing site-suitability models to locate proposed well pads according to environmental and regulatory constraints. In addition, SG will line the reserve pits with 12-mil (minimum thickness) felt-backed liners to minimize the chance of leakage into the soil beneath the ponds.

Water balance (the amount of water produced vs. the capacity to dispose/store produced water) is a topic of potential concern related to natural gas development projects. As discussed above, between 2,500 and



15,000 bbls of produced water would be removed per day from Mesaverde Group and Mancos Shale aquifers to facilitate the natural gas recovery process. SG estimates that between 500 and 3,000 bbls per day of produced water would be injected into each of the five water disposal wells at full build-out of the Unit (BLM 2011), indicating that all produced water not reused for well completion would be disposed of through injection. Based on disposal rates documented at Federal 24-2 (an operating disposal well within the Unit), the maximum disposal rate for each well could be 5,000 bbls per day, which is well above the rate needed to inject the maximum amount of water produced.

As described in Appendix B, four flowback pits with 24-mil felt-backed liners are being constructed within the Unit. The primary purpose of flowback pits is to store water, including flowback and produced water, to minimize the consumptive use of water for well completion operations and hydraulic fracturing. The combined capacity of the four proposed flowback pits would be approximately 348,000 bbls (45 ac-ft) of water. SG estimates that the maximum water demand for hydraulic fracturing would be approximately 23.2 ac-ft per well, based on 30,000 bbls of water per fracturing treatment and six treatments per well. Typically about 50 percent of the water injected in a fracturing operation returns to the surface as flowback and is stored temporarily in lined flowback pits. Based on the maximum of three rigs working at any one time during the drilling season (May-November), the maximum total return flow would be 34.8 ac-ft (well within the total capacity of the flowback pits). As discussed in Appendix B, to ensure that sufficient capacity exists in the flowback pits for flowback water, pit fluid levels will be visually monitored daily and at least two feet of freeboard will be maintained in the pits at all times. The pit liners will be marked to indicate maximum capacity so that the inspector can easily verify that each pit has sufficient freeboard. The volume of return flows can be adjusted at each wellhead to maintain the flowback pits at the proper capacity. The flowback pits will remain in place for their useful life and these flowback facilities would be available as a backup or buffer for produced water storage should disposal well capacity be curtailed for maintenance or repair.

Adherence to Best Management Practices listed in Appendix C would minimize the potential for impacts to surface and groundwater resources under the Proposed Action. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The cumulative impacts assessment area for water resources is considered to be the greater Muddy Creek basin.

Surface Water: Cumulative impacts to surface water would be limited to the surface water features within the same watersheds that are affected by the Proposed Action. Potential cumulative impacts to surface water resources from the Proposed Action in combination with the No Action Alternative would include increased turbidity and sedimentation in water courses, short-term runoff, and salt-loading, contamination of surface water courses and ponds by produced water and petroleum, and depletion of surface water flows in nearby streams.

In May 2008, the BLM prepared a Programmatic Biological Assessment (PBA) that addresses water-depleting activities associated with the BLM's fluid minerals program in the Colorado River Basin in Colorado. In response to the BLM's PBA, the FWS issued a Programmatic Biological Opinion (PBO) (ES/GJ-6-CO-08-F-0006) on December 19, 2008, which determined that BLM water depletions from the Colorado River Basin are not likely to jeopardize the continued existence of the Colorado pikeminnow, humpback chub, bonytail, or razorback sucker, and that BLM water depletions are not likely to destroy or adversely modify designated critical habitat.

A Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin was initiated in January 1988. The Recovery Program serves as the reasonable and prudent alternative to avoid jeopardy and provide recovery to the endangered fishes by depletions from the Colorado River Basin. The PBO addresses water depletions associated with fluid minerals development on BLM lands, including water used for well drilling, hydrostatic testing of pipelines, and dust abatement on roads. The PBO includes reasonable and prudent alternatives developed by the FWS which allow BLM to authorize oil and gas wells that result in water depletion while avoiding the likelihood of jeopardy to the

endangered fishes and avoiding destruction or adverse modification of their critical habitat. As a reasonable and prudent alternative in the PBO, FWS authorized BLM to solicit a one-time contribution to the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (Recovery Program) in the amount equal to the average annual acre-feet depleted by fluid minerals activities on BLM lands.

This project has been entered into the Uncompahgre Field Office fluid minerals water depletion log which will be submitted to the Colorado State Office at the end of each fiscal year.

Groundwater: Cumulative impacts to groundwater would be limited to the groundwater aquifers that are affected by the Proposed Action, Alternative 1, and No Action Alternative. Potential cumulative impacts include contamination of groundwater aquifers with hydraulic fracturing fluids, produced water, drilling mud, or petroleum and include impacts to shallow groundwater aquifers due to changes to the hydrologic function of impacted drainages. Cumulative impacts could also result when drilling/completion operations and infrastructure construction inhibit infiltration of surface water into shallow groundwater aquifers and when produced water is removed from target formations to facilitate the natural gas recovery process.

The primary disposal zones for the proposed injection wells are the Dakota Sandstone, Morrison Formation, Entrada Sandstone, or Maroon Formation at depths between 9,300 and 9,500 feet. Rules promulgated by COGCC and approved by EPA regulate the injection of produced water into underground aquifers (COGCC 2009). Natural gas developers must demonstrate that formations targeted for injection meet the criteria for an exempt aquifer, per COGCC Rule 324B(a) prior to injection of produced water, or water injection will not be permitted. Water quality data from the one operational disposal well within the Unit (Federal 24-2 WDW) indicated that the TDS concentration within the disposal zone (Maroon Formation) is 18,962 mg/L. The quality of the water in the other horizons targeted for injection will likely be of similar, poor quality and they would likely qualify as exempt aquifers, suitable to accept produced water.

Due to the depth separation between proposed production wells and existing non-industrial use water wells, non-target aquifers in the area would not be impacted by the cumulative removal of water resulting from natural gas development in the area if proper well drilling procedures and completion techniques are utilized. CDRW requires natural gas wells permitted through the COGCC also be permitted for industrial use for removal of produced groundwater associated with oil and gas exploration and production. Additional groundwater removed from targeted aquifers as a result of cumulative natural gas development would not adversely impact the industrial wells permitted in the Unit.

Cumulative impacts to surface and groundwater would be minimized with implementation of applicable BMPs listed in Appendix C. In addition, BLM may attach additional site-specific COAs to the APDs.

**Alternative 1 – Surface Water:** Alternative 1 would require 3.3 fewer miles of new or improved access roads and 4.5 fewer acres of new production disturbance as compared to the Proposed Action, and would place development higher on ridges and side-slopes. Disturbance from Alternative 1 would cross fewer perennial streams (16 vs. 17), intermittent streams (30 vs. 41), and impact more acres of wetlands (19.4 vs. 16.6).

The types of construction impacts would be the same as for the Proposed Action, affecting approximately 255.8 acres (1.3% of the Unit). Impacts would likely be greatest during the construction and drilling phase. Production disturbance would total approximately 121.4 acres (0.62% of the Unit). Surface water quality could also be affected by the water use requirements of the project.

Groundwater: The types and level of potential impacts to groundwater resources from Alternative 1 would be similar to the Proposed Action.

Adherence to Best Management Practices listed in Appendix C would minimize the potential for impacts to surface and groundwater resources under Alternative 1. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The types of cumulative impacts to water resources from the implementation of Alternative 1 in combination with the No Action Alternative would be the same as for the Proposed Action. Compared to the Proposed Action, there would be 4.5 fewer acres of production disturbance and fewer total stream crossings; however, there would be 2.8 acres of additional disturbance to wetlands, and new development would be higher on ridges and side-slopes.

**No Action Alternative** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would develop up to 55 new wells on 11 well pads on fee surface and would add up to 11 wells to existing well pads. The No Action Alternative would require 9.3 fewer miles of new access roads and 45.6 fewer acres of new production surface disturbance as compared to the Proposed Action. The types of impacts to water resources would be similar to those described for the Proposed Action and Alternative 1.

**Finding on the Public Land Health Standard for water quality: Finding on the Public Land Health Standard for water quality:** Indicators used to assess standard 5 (water quality standards for surface water and groundwater) include: appropriate populations of macroinvertebrates, vertebrates, and algae; pollutants; and sedimentation attributable to human activity. Public land health standards for water quality within the North Fork area, which includes the project area, were assessed in the 2006-2007 Land Health Assessment for the North Fork Landscape (BLM 2007a). According to the assessment, water quality of all water bodies, including groundwater where applicable, located on or influenced by BLM lands will achieve or exceed the water quality standards established by the state of Colorado (BLM 2007a). Over-appropriation of surface water is a significant problem in the North Fork area (BLM 2007a), which negatively impacts macroinvertebrates. Since surface water quantities could be affected by water use requirements for the Proposed Action, Alternative 1, and the No Action Alternative, cumulative impacts to surface water could occur downstream of the Unit. Regarding pollution, the 2010 303(d) list of segments needing the TMDLs includes one segment within the North Fork Gunnison River (from Black Bridge above Paonia to the confluence with the Gunnison River), which is listed as impaired due to selenium. This segment is downstream of the Unit and is the only stream segment on the mainstem of the North Fork Gunnison River drainage on the State's Section 303(d) list. Selenium is not an issue within the project area. Accelerated yield of sediment from upland soil and stream channel erosion is the most widespread water quality issue in the North Fork area. Since surface disturbance and the potential for erosion would increase with the Proposed Action, Alternative 1, and the No Action Alternative, cumulative impacts to accelerated sediment yields could occur downstream of the Unit. Implementation of BMPs and COAs attached to the APDs would minimize the impacts from the Proposed Action, Alternative 1, or the No Action Alternative and ensure that standard 5 would continue to be met.

## **WASTES, HAZARDOUS OR SOLID**

**Affected Environment:** The affected environment for hazardous materials includes air, water, soil, and biological resources that may potentially be affected by an accidental release of hazardous materials during transportation to and from the Unit, storage, and use in construction, drilling, and operations. Sensitive areas for hazardous materials releases include areas adjacent to water bodies, above aquifers, and areas where humans or wildlife would be directly impacted.

The most pertinent of the federal laws dealing with hazardous materials contamination are as follows:

- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, Public Law 96-510 of 1980) provides for liability, compensation, cleanup, and emergency response for hazardous substances released into the environment. It also provides national, regional, and local contingency plans. Applicable emergency operations plans in place include the National Contingency Plan (40 CFR 300, required by Section 105 of CERCLA), the Region VIII Regional Contingency Plan, and the Gunnison County Emergency Operations Plan (developed by the Gunnison County Office of Emergency Management).

- The Resource Conservation and Recovery Act (RCRA) (Public Law 94-580, October 21, 1976) regulates the use of hazardous substances and disposal of hazardous wastes. Note: While oil and gas lessees are exempt from RCRA, right-of-way holders are not. RCRA strictly regulates the management and disposal of hazardous wastes.

In addition, the EPA and CDPHE require a Spill Prevention, Countermeasure, and Control Plan (SPCC) to be developed and implemented by SG and its subcontractors as applicable and appropriate. The SPCC is intended to preclude the release of oils such as diesel fuel, gasoline, crude oil, or condensate, into the waters of the United States. The plan must also provide response actions to be taken, and notifications to be made, in the event a release occurs.

According to 29 CFR 1910.1200(g), SG is required to maintain a file containing Material Safety Data Sheets for all chemicals, compounds, and/or substances utilized during the course of construction, drilling, completion, and production operations of this project. This file is to be available at all times when employees are present at the site. BLM Instruction Memoranda numbers WO-93-344 and CO-97-023 require that all National Environmental Policy Act documents list and describe any hazardous and/or extremely hazardous materials that would be produced, used, stored, transported, or disposed of as a result of a proposed project.

On December 13, 2011 the State of Colorado enacted a new rule, CCR §404-1:205A, requiring vendors and providers of hydraulic fracturing services to provide the operator of a natural gas well with the identity of each additive and each chemical intentionally added to the hydraulic fracturing fluid, within 30 days following the conclusion of the hydraulic fracturing treatment (Nettles et al. 2011). The operator must then complete a chemical disclosure registry form and post the form to a national public website, fracfocus.org, within 60 to 120 days. The operator must disclose the concentration of the chemical or additive, but is not required to disclose the brand name of the product or additive to which the disclosed chemical/chemical concentration is a component. A vendor, service provider, or operator may claim that the specific identity and/or concentration of a chemical is entitled to trade secret protection and may withhold disclosure of this information on that basis. However, the identity and amount of any chemicals claimed to be a trade secret must be identified to any health professional who requests such information in writing (and agrees to keep the information confidential) for the purpose of diagnosing or treating an individual who may have been exposed to such chemicals. Likewise, this information must be provided to the COGCC upon receipt of a letter stating that such information is necessary to respond to a spill or release, or a complaint from a person who may have been directly and “adversely affected or aggrieved” by a spill or release.

Typical hazardous materials present or likely to be present in the project area during development and production are listed in Appendix F and include:

- drilling mud and cementing products, which are primarily inhalation hazards;
- flammable or combustible motor fuels;
- proprietary materials necessary for well completion and stimulation, such as acids and gels (corrosives);
- fluids such as ethylene glycol that may be used in dehydration units, and are known to be toxic to wildlife and cattle; and
- human solid and liquid wastes, generated primarily during the construction and drilling phases of the project.

Any substances classified as Extremely Hazardous by the Superfund Amendments and Reauthorization Act of 1986 would be limited to proprietary treating chemicals. Materials generated during drilling include drill cuttings, combined with drilling fluids and additives used to maintain circulation and reduce borehole caving and accomplish cementing of the borehole annulus. These fluids would be confined to the borehole and reserve pit.

### **Environmental Consequences/Mitigation:**

**Proposed Action** – Possible pollutants that could be released during the construction phase of this project would include diesel fuel, hydraulic fluid, and lubricants. These materials would be used during construction of the access roads, pads, and gathering lines, and for refueling and maintaining equipment and vehicles. Potentially harmful substances used during construction and operation would be kept on-site in limited quantities and trucked to and from the site as required. No hazardous substance, as defined by 40 CFR 355, would be used, produced, stored, transported, or disposed of in amounts above threshold quantities.

Waste generated by construction activities would not be exempt from hazardous waste regulations under the oil and gas exploration and production exemption of RCRA. Exempt wastes would include those associated with well production and transmission of natural gas through the gathering lines and the natural gas itself.

With the exception of produced hydrocarbons, ethylene glycol (antifreeze), lubricants, and amine compounds, chemicals subject to reporting under Title III of the Superfund Amendments and Reauthorization Act in quantities of 10,000 pounds or more would not be used, produced, stored, transported, or disposed of during construction or operation of the facilities. None of the chemicals that would be used in construction meet the criteria for an acutely hazardous material/substance, or meet the quantities criteria per BLM Instruction Memorandum No. 93-344. In addition, no extremely hazardous substance, as defined in 40 CFR 355, in amounts above threshold planning quantities would be produced, used, stored, transported, or disposed of during construction or operation of the facilities.

Solid waste (human waste, garbage, etc.) would be generated during construction activities and, to a limited extent, during project operations. These would be removed to a landfill or water treatment facility as needed, and all would be removed prior to interim reclamation.

Surface water or groundwater could be impacted under the Proposed Action. Pollutants that might be released during the operational phase of the project could include condensate, produced water, and glycol (carried to the site and used as antifreeze). While uncommon, an accident could occur that could result in a release of any of these materials. A release could result in contamination of surface water or soil. Improper casing and cementing procedures could also result in contamination of groundwater resources. In the case of any release, emergency or otherwise, the responsible party would be liable for cleanup and any damages. Depending on the scope of the accident, any of the above-referenced contingency plans could be activated to provide emergency response. At a minimum, the BLM Uncompahgre Field Office contingency plan would apply.

These laws, regulations, standard lease stipulations, conditions of approval, and contingency plans and emergency response resources are expected to adequately mitigate any potential hazardous or solid waste issues associated with the Proposed Action.

The impact of the Proposed Action from exposure to hazardous or solid wastes would be low to moderate and short-term during construction and low and long-term during production operations. Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts from hazardous or solid waste. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The cumulative impacts assessment area for wastes and hazardous materials management includes the Bull Mountain Unit and vicinity southwest to the Delta County Landfill. Cumulative impacts would occur across the assessment area from the reasonably foreseeable combined implementation of the No Action Alternative in combination with the Proposed Action, added to other natural gas development and coal mining in the area. Over its lifetime the project would add to the volume of solid waste as well as wastes from drilling, completion, well workovers, and final reclamation (pit liners) to be disposed of at approved facilities. It is not anticipated that this volume would significantly stress the permitted capacity of existing facilities or necessitate the permitting and construction of additional disposal facilities in proximity to the Unit.

**Alternative 1** – The types and level of impacts for Alternative 1 would be the same as for the Proposed Action. Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to wetlands and riparian areas. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The types and level of cumulative impacts from hazardous and solid wastes from the implementation of Alternative 1 in combination with the No Action Alternative would be the same as for the Proposed Action.

**No Action Alternative** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would develop up to 55 new wells on 11 well pads on fee surface and would add up to 11 wells to existing well pads. The types and level of general impacts, as well as fuel spill data, reporting requirements, and spill containment/cleanup would be the same as for the Proposed Action.

## ENVIRONMENTAL JUSTICE

**Affected Environment:** Presidential Executive Order 12898 mandates that high and/or adverse environmental impacts resulting from federal actions will not be disproportionately borne by minority or low-income populations. Disproportionate impacts are those that would affect minority or low-income populations at levels appreciably higher than effects to non-minority or non-low income groups. Minority populations include those of Hispanic or Native American ethnicity. These populations, as well as some Caucasians, also tend to constitute the low-income groups in the area (USCB 2009a, 2009b).

### Environmental Consequences/Mitigation:

**Proposed Action** – The location and construction of project features would not disrupt any identified minority and/or low-income communities. The Proposed Action would, in fact, provide additional job opportunities during construction and development of the well sites, because SG contracts this work to local companies. No disproportionate negative impacts to the human or economic health of these communities are anticipated as a result of the Proposed Action. No mitigation measures specific to environmental justice would be required.

**Cumulative Impacts** – The cumulative impacts assessment area for environmental justice includes Gunnison and Delta Counties. Short-term cumulative impacts, when added to existing, planned, and reasonably foreseeable natural gas and coal mining activities in the area, including implementation of the Proposed Action in combination with the No Action Alternative, would include increased employment opportunities for construction workers and laborers during the build-out of the project, and are anticipated to be low as a percentage of overall employment within the cumulative impacts assessment area. Long-term cumulative impacts would be minimal since the workforce would be reduced to well inspection, maintenance, and periodic workover personnel for the life of the project.

**Alternative 1** – Direct and indirect impacts to environmental justice would be similar to impacts from the Proposed Action. No mitigation measures specific to environmental justice would be required.

**Cumulative Impacts** – The types and level of cumulative impacts to environmental justice from the implementation of Alternative 1 in combination with the No Action Alternative would be the same as for the Proposed Action.

**No Action Alternative** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would develop up to 55 new wells on 11 well pads on fee surface and would add up to 11 wells to existing well pads. This would be approximately 44% of the wells planned under the Proposed Action, proportionately reducing the opportunity for employment during the construction and drilling phases of the project. The types of direct and indirect impacts to environmental justice would be similar to impacts from the Proposed Action.

## OTHER ELEMENTS

The following elements (Table 45) are also considered during the NEPA process.. Those that could be impacted are brought forward for analysis.

**Table 45. Other Elements**

Other Elements	Not Applicable or Not Present	Present, But No Impact	Applicable & Present; Brought Forward for Analysis
Access			X
Transportation			X
Cadastral Survey	X		
Realty Authorizations			X
Rangeland Management			X
Forest Management	X		
Fire			X
Hydrology/Water Rights			X
Noise			X
Recreation			X
Visual Resources			X
Geology and Minerals			X
Paleontology	X		
Law Enforcement	X		
Socio-Economics			X

## ACCESS

**Affected Environment:** Primary access to the Bull Mountain Unit is from State Highway (SH) 133, which is paved, and/or from Gunnison County Road (CR) 265, which is graveled. From SH 133 and CR 265, ranches, agricultural lands, and existing well sites are accessed via private roads and several of the private roads have gates.

### Environmental Consequences/Mitigation:

**Proposed Action** – Increased traffic as a result of construction, drilling, and completion activities (discussed in the Transportation section) would create short-term direct impacts to access for residents and visitors within and in the vicinity of the Unit through project build-out. These impacts would fluctuate from low to moderate during various phases of development, and would be confined to the drilling season. Rutting when wet and overall road deterioration would result if roads are not properly maintained or are used in inclement weather, impairing access. Long-term direct impacts to access would be low, consisting of traffic generated by daily well inspections and periodic well workovers. Short-term and long-term indirect impacts would include increased access to federal lands through the increased road network. No mitigation measures specific to access would be required.

**Cumulative Impacts** – The cumulative impacts assessment area for access includes the Bull Mountain Unit and immediate vicinity. Cumulative impacts would occur from the reasonably foreseeable implementation of the Proposed Action in combination with the No Action Alternative. Short-term and long-term direct and indirect cumulative impacts to access would be minimal, and would be associated with increased traffic generated by well servicing, maintenance, and periodic workovers, added to planned and reasonably foreseeable development within the Unit.

**Alternative 1** – Short-term and long-term direct and indirect impacts to access for well pad construction, drilling, completion, production, and maintenance would be similar to the impacts described for the Proposed Action. No mitigation measures specific to access would be required.



**Cumulative Impacts** – The types and level of cumulative impacts to access from the implementation of Alternative 1 in combination with the No Action Alternative would be the same as for the Proposed Action.

**No Action Alternative** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would develop up to 55 new wells on 11 well pads on fee surface and would add up to 11 wells to existing well pads. This would be 44% of the wells planned under the Proposed Action, which would proportionately reduce the overall duration of construction, and hence the impacts to access. The types of short-term and long-term direct and indirect impacts to access for well pad construction, drilling, completion, production, and maintenance would be similar to the impacts described for the Proposed Action.

## TRANSPORTATION

**Affected Environment:** Existing regional traffic on SH 133 and CR 265 consists primarily of local residents, farmers and ranchers, tourists, and commercial vehicles, including light and heavy trucks from the mineral extraction industries. Average annual daily traffic (AADT) on SH 133 between Hotchkiss and Marble for the year 2009 (the latest year for which data is currently available), including the percentage of truck traffic, is shown in Table 46.

**Table 46. Annual Average Daily Traffic, SH 133 between Hotchkiss and Marble, CO – 2009**

Begin at Mile Marker	End at Mile Marker	Start Point Description	AADT	Percent Trucks
0	2.222	NE of SH 92, Bridge Street, Hotchkiss	5,200	4.7%
2.222	7.822	NE of Henson Mesa Rd, CR L.25	3,700	8.6%
7.822	8.858	SW of SH 187, Grand Ave., Paonia	2,900	8.3%
8.858	12.170	SW of Bowie Rd., W junction	2,700	7.9%
12.170	16.000	NE of Bowie Rd., W junction	2,100	10.0%
16.000	17.667	NE of Bowie Rd., E junction	3,100	9.4%
17.667	18.211	SE of 4 <sup>th</sup> St., CR 57, Somerset	2,200	8.2%
18.211	24.000	W of Kebler Pass Rd., CR 12	1,300	10.4%
24.000	46.371	S of CR 3, to Marble	1,400	6.3%
46.371	51.357	N of CR 3, to Marble	1,600	5.2%
Average, all monitoring sites			2,620	8.2%

Source: Colorado Department of Transportation

Gunnison County conducts annual traffic counts on CR 265, also known as Muddy Creek Road. For the period July 31 through October 15, 2007 (the latest period for which data are available), the average daily traffic count was 205 vehicles (102 northbound and 103 southbound).

SG executed Gunnison County Road Improvement Agreement on September 13, 2005 and the First Amendment to Road Improvement Agreement on July 11, 2006 for improvements to CR 265. Gunnison County holds Performance/Utilization Bond No. RLB0004678 in the amount of \$10,000 to warrant against road damage to CR 265. In addition, SG and Gunnison Energy have executed an agreement with Gunnison County under which they pay the county to install magnesium chloride product on CR 265 twice each year.

### **Environmental Consequences/Mitigation:**

Vehicle trips would be generated by road and well pad construction, drilling and completion activities, installation of electrical lines at water-disposal wells, production activities including routine monitoring and maintenance, as well as periodic well workovers. Interim and final reclamation activities would also generate vehicle trips. Vehicle trips would originate from a variety of locations outside the

Unit; it is estimated that 75% of vehicle trips would originate from the south (Montrose, Delta, Hotchkiss, and Paonia), and 25% from the north (Redstone). Drilling rigs and some gas-field service and construction equipment would be transported to the Unit and remain there for the duration of a particular contract or task. Drilling rigs would work continuously throughout the drilling season; therefore, trips involving major pieces of equipment, such as rig moves, would occur primarily within the Unit.

**Proposed Action** – Approximately 13.5 miles of road upgrades, 12.2 miles of new road construction, and 22.1 miles of new pipeline (11.4 miles co-located with roads) would be required under the Proposed Action. The proposed use of multi-well pads greatly reduces the need for construction of new access roads and pipelines. Access roads would be constructed using standard crown-and-ditch specifications as required by Gunnison County and BLM, and would have a 15-foot-wide running surface. Construction impacts are discussed in other sections of this EA.

Table 47 summarizes the types and volume of vehicle traffic associated with construction, drilling, completion, and production activities during each drilling season (approximately mid-May through mid-October, depending on weather and site conditions). For the purpose of this analysis, the average size of a well pad is 1.4 acres, the average length of a new access road per well pad is 0.6 mile, and the average length of new pipeline per well pad is 0.7 mile.

**Table 47. Traffic Associated with Construction, Drilling, Completion, and Production**

Phase	Average Duration	Vehicle Type	Average Trips <sup>1</sup>	
			Per Well Site	Per Day
Well pad/access road construction	28 days 10 hrs/day	Gravel trucks, semis, pickups	1,456	52
Drilling, new well on new pad	23 days <sup>2</sup>	Tractor trailer; cement, hydraulic fracturing, and mud trucks; crew cab pickup	474	20
Drilling, new well on existing pad	23 days <sup>2</sup>	Motor grader; tractor trailer; cement, hydraulic fracturing, and mud trucks; crew cab pickup	638	28
Completion/testing, CBNG wells	12 days	Haul trucks	16	.75
Completion/testing, shale gas wells	12 days	Haul trucks	24	2
Gathering pipeline construction	10 days	Tractor trailer (to transport heavy equipment); pipe, welding, X-Ray, and testing trucks; crew cab pickups	62	6
Production	40 years	Pickup (pumper)	--	8 <sup>3</sup>
Maintenance/workover	7 days every 2 years	Haul truck, pickups, water trucks	84	12

<sup>1</sup> Representative numbers from Gunnison County permit applications submitted by SG. One round-trip is equal to 2 trips.

<sup>2</sup> Average of CBNG wells (8-10 days) and shale gas wells (35 days).

<sup>3</sup> At full buildout, a total of 4 pumpers, each making 1 round trip daily, would be required for routine servicing of all well sites.

Traffic increases on SH 133 and CR 265 as a result of the Proposed Action would fluctuate according to the phase of construction and development, and would be highest during well pad and access road construction. Construction of a single well pad and access road would add 52 trips per day to CR 265 and SH 133. Well-servicing technicians (known as pumpers) would visit each existing well site via pickup truck on a daily basis over the life of the project, adding two vehicle trips per day to traffic on SH 133 and CR 265. Each pumper would service 10 to 12 well sites per day. Assuming the simultaneous construction of 3 well pads and access roads, and including daily servicing of wells at 14 existing well sites, the total traffic increase would be 160 trips per day over a 20-day period in Year 1 of development, representing a 78% increase in traffic on CR 265 and a 6% increase in traffic on SH 133. The maximum trips per day would increase each year through Year 6 of development, as additional wells are completed and daily

servicing trips are added. Assuming a total of 44 well pads in operation during construction of the final 3 well pads, the Proposed Action would add 164 trips per day, representing an 80% increase in traffic on CR 265 and a 6% increase in traffic on SH 133.

During drilling and pipeline construction activities, assuming simultaneous drilling of 3 wells at any one time and including daily servicing of existing wells, average trips per day would drop to 108 in Year 1 of development, representing a 56% increase in traffic on CR 265 and a 4% increase in traffic on SH 133 for much of the drilling season. In Year 6, during drilling of the final 3 wells and including servicing of all existing wells, average trips per day would increase to 126, representing a 61% increase in traffic on CR 265 and a 4.8% increase in traffic on SH 133. The potential for traffic delays, accidents, and vehicle/wildlife collisions would be commensurate with these increases in traffic.

Other impacts would include general road degradation of SH 133, CR 265, and the well site access roads. Generation of dust when dry, rutting when wet, and overall road deterioration would result if the access roads are not properly maintained or are used in inclement weather. Application of magnesium chloride to CR 265 could be toxic for vegetation alongside the road. Short-term direct impacts to traffic would fluctuate from low to moderate and would be seasonal during the build-out of the project.

Once every two years, a workover rig would be brought to each site to perform required maintenance over a period of approximately 7 days. Direct impacts to traffic would be low and long-term from maintenance and workover during the life of the project. Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to transportation. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The cumulative impacts assessment area for transportation includes the Bull Mountain Unit, SH 133 between Marble on the north and Montrose on the south, and CR 265 in the immediate vicinity of the Unit. Cumulative impacts would occur from the implementation of the Proposed Action in combination with the No Action Alternative. Over time, increased road use by recreationists on the Grand Mesa would incrementally increase road use. Increased traffic within and proximate to the Unit as a result of the project, when added to other existing, planned, and reasonably foreseeable natural gas and coal mine development, as well as and road reconstruction planned by CDOT on SH 133, would have low to moderate short-term cumulative impacts and low long-term cumulative impacts to transportation.

**Alternative 1** – The criteria used to develop Alternative 1 were weighted more toward minimizing the amount of new roads and pipelines than the Proposed Action. Approximately 11.4 miles of road upgrades, 11.7 miles of new road construction, and 16.1 miles of new pipeline (7.6 miles co-located with roads) would be required under Alternative 1. The total length of access roads required would be reduced by approximately 10%, and the total length of pipelines required would be reduced by approximately 8% compared to the Proposed Action, proportionately reducing the overall number of days required for construction from 20 days to 18 days for each section of access road, and from 10 days to about 9 days for each pipeline segment. The types and levels of direct and indirect impacts from daily traffic for well pad construction, drilling, completion, production, and maintenance would be the same as for the Proposed Action. Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to transportation. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The types and volume of cumulative impacts to transportation from the implementation of Alternative 1 in combination with the No Action Alternative would be the same as for the Proposed Action. The estimated number of required vehicle trips per day would be the same.

**No Action Alternative** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would develop up to 55 new wells on 11 well pads on fee surface and would add up to 11 wells to existing well pads. Approximately 2.3 miles of road upgrades, 2.9 miles of new road construction, and 11.3 miles of new pipeline (2.4 miles co-located with roads)

would be required to develop and produce fee/fee wells under the No Action Alternative. Total length of access roads required would be reduced by approximately 63%, the total length of pipelines required would be reduced by 70%, and the total number of wells drilled would be reduced by 56% compared to the Proposed Action. These reductions in construction and drilling activity would proportionately reduce the overall duration of the development phase to approximately 2 years, and hence the overall number of vehicle trips required. However, the level and types of direct and indirect impacts from daily traffic for access road and well pad construction, drilling, completion, and servicing would be similar to those of the Proposed Action for those 2 years. During the production phase of the project, 2 to 3 pumpers would be required for daily servicing of 24 well sites, adding 4 to 6 vehicle trips to CR 265 and SH 133 for the life of the project.

## REALTY AUTHORIZATIONS

**Affected Environment:** Existing federal realty authorizations within the Unit include rights-of-way for SH 133 (Colorado Department of Transportation), DMEA power lines, a Delta County Tele-Com telephone line, the Volk Ditch and private access rights-of-way. Holders of these rights-of-way would be notified prior to construction near their facilities or access roads.

### **Environmental Consequences/Mitigation:**

**Proposed Action** – Construction of a new access road from SH 133 to the proposed FED 11-89-20 #3 could have short-term, temporary impacts to traffic on SH 133 during staging and initial construction of the access road. Construction of a segment of pipeline running alongside and to the east of SH 133 in T11S, R89W, Section 8, would have short-term temporary impacts to traffic on SH 133. No impacts would be anticipated for private access easements within the Unit. No mitigation measures specific to realty authorizations would be required.

**Cumulative Impacts** – The cumulative impacts assessment area for Realty Authorizations is the Bull Mountain Unit. No short-term or long-term cumulative impacts to federal rights-of-way or easements are anticipated.

**Alternative 1** – Impacts to realty authorizations would be the same as for the Proposed Action. No mitigation measures specific to realty authorizations would be required.

**Cumulative Impacts** – No short-term or long-term cumulative impacts to federal rights-of-way or easements are anticipated.

**No Action Alternative** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would develop up to 55 new wells on 11 well pads on fee surface and would add up to 11 wells to existing well pads. No new access roads connecting to SH 133, or new pipelines alongside SH 133 would be constructed under the No Action Alternative, and no impacts would be anticipated for other federal rights-of-way or easements within the Unit.

## RANGELAND MANAGEMENT

**Affected Environment:** Until recently, this area sustained very high levels of both sheep and cattle grazing. Larger ranches within the Unit still host both cattle and sheep grazing, but sheep grazing is mostly limited to ranches at the northern end of the Unit. The McIntyre Livestock Company (which previously owned Rock Creek Ranch) once ran 20 bands of sheep (a band is 1,000 sheep) in this area. Currently, McIntyre Livestock runs one band, and another rancher (Sperry) runs one band northeast of this area. In addition, seasonal cattle grazing occurs in this area, and a grazing permit is leased back to McIntyre Livestock for grazing on the Rock Creek Ranch. On the Rock Creek Ranch, McIntyre Livestock runs 173 cow-calf pairs in one area and 134 pairs in another, plus 10 heifers. The grazing season is highly variable depending on weather, but in general is from June through early December. Rock Creek Ranches itself does not own cattle at this time.

The Jacobs Ranch is located at the eastern side of the Unit and is a working cattle ranch. This ranch supports a cow-calf operation, with grazing occurring from May 15<sup>th</sup> through December. A maximum of 225 cow-calf pairs graze on 2,000 acres of pasture. Cattle start the early season on south-facing slopes north of SH 133, and in mid-July are moved south of SH 133. No cattle are grazed during the winter/spring months on the ranch. Irrigation starts around the end April or early May, and ends in late August to early September. Meadows are hayed for grass-hay production.

The Falcon Seaboard Ranch was consolidated from several smaller ranches in 1990 and was purchased by Falcon Seaboard in its current configuration in 1996. Prior to 1996 the ranch was used for both cattle and sheep grazing, but currently only sees cattle grazing. The ranch supports both a cow/calf and yearling calf operation. Yearlings are brought on (via stock trucks) in early May and grazed through the summer to early September. Cows and nursing calves are trucked to the ranch in early June and come off in early October. No cattle are grazed during the winter/spring months on the ranch. Irrigation of meadows starts around the end of April or early May, and ends in late August to early September. Meadows are hayed for grass-hay production.

Other large ranches in the Unit include the Sperry, Aspen Leaf, and Hotchkiss ranches, all of which support cow/calf and yearling calf operations as well as sheep grazing. Sheep generally graze the ranches in the spring, and are moved onto summertime allotments on USFS lands on the GMUG and White River National Forests. They are trailed back down onto the ranches in the late fall, where they graze on upland meadows, and on irrigated hay fields post-haying. All sheep are generally trucked out of the Muddy Creek basin by early November for market. On the Hotchkiss Ranch, a small herd of sheep (around 30) persists through the summer on the ranch.

Despite the extremely high grazing pressure in the past, the area has a very good distribution of grasses and forbs in the understory of the sagebrush and Gambel's oak habitat types. Within the general area, aspen stands and various increaser species of plants indicate high long-term grazing pressure. These increasers include skunk cabbage (*Veratrum tenuipetalum*), tall larkspur (*Delphinium barbeyi*), tarweed (*Madia glomerata*), and sneezeweed (*Helenium autumnale*). Notable evidence of habitat degradation from past and current grazing was not apparent during a site visit. The dense stands of Gambel's oak are too thick to be greatly utilized by livestock.

Along the SH 133 corridor, from the intersection of SR 265 and south, there is a lack of widespread large ranches, but cattle are often wintered on the lower-elevation meadows near Muddy Creek. Subdivisions and smaller lot sizes have decreased the connectivity of larger ranches, and less cattle grazing occurs. Further, the steeper topography and drier climate reduce grazing opportunities at the southern end of the Unit.

On ranches with elk winter ranges (e.g., lower-elevation, south- and west-facing slopes) there can be quite a bit of elk wintering activity. The Jacobs Ranch currently has concerns and management issues over heavy elk utilization on winter ranges.

### **Environmental Consequences/Mitigation:**

**Proposed Action** – Sheep and cattle grazing would continue during development and operation of the Unit. The primary impact would be the short-term loss of available forage resulting from construction-related disturbance, and the long-term loss of forage due to installation of production facilities including access roads, well pads, and electrical lines. Across the Unit, 125.9 acres (0.64% of the Unit) would be lost for potential grazing as a result of conversion to roads, pads, and other long-term surface uses. This calculation assumes that all vegetation in these areas provides potential livestock grazing; however, some vegetation types such as oakbrush and sagebrush are not palatable for cattle or sheep so the actual amount would be less. Cattle and sheep do not “avoid” roads and pads like wildlife does, so there would be no indirect impacts per se.

Under the Proposed Action, approximately 5.4 acres of irrigated pasturelands would be lost to development during production, or a total of 0.2% of available irrigated pasturelands within the Unit.

Reclamation of pipeline corridors, in many situations, would convert unpalatable sagebrush, oakbrush, and mixed mountain shrubland species to more palatable grasses, resulting in a net increase in potential grazing acres within the Unit.

SG also fences off their pad sites to keep livestock off of reclaimed areas, and also fences off wetlands and steep slopes where reclamation activities require less disturbance from livestock to allow for more rapid soil stabilization and resource protection. This would also add insignificant amounts of lost grazing potential.

Deposition of dust on roadside vegetation is a direct source of potential impacts to rangeland. In addition to the impacts on the health of potential forage described in the Vegetation section, it can result in decreased palatability and avoidance by livestock, as well as increased tooth wear.

Other impacts that are harder to quantify include additional gates, replacement of fences, and increased traffic on ranches. While replacement of old fences would be a benefit to ranchers (as SG pays for the replacement or upgrade), additional gates and new fences would likely require additional time and effort for ranchers to work livestock and manage grazing. There would likely be some lost grazing revenue for some ranches with proportionately larger lost grazing availability. However given that less than 1% of grazing acres across the entire Unit would be impacted, the revenues lost to ranchers from decreased forage production would be insignificant. This is especially true when factoring in the conversion of shrublands to grass-dominated vegetation on pipeline corridors, where it has been documented that livestock congregate in order to graze on new grass growth.

Potential positive impacts include additional sources of income to ranches through lease fees or surface-use agreements that provide for compensation of lost revenue due to conversion of rangelands into non-producing status, or loss of irrigated hay meadows. Replacement of old fence lines at the expense of SG could help with long-term costs of maintaining ranching infrastructure. SG may also assist in paying for rangeland improvement projects (sagebrush mowing), as well as new or repaired stock tanks, as they have in the past.

Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to rangeland. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The cumulative impacts assessment area for rangeland management is considered to be the Bull Mountain Unit. Cumulative impacts within the Unit would include the combined implementation of the Proposed Action in combination with the No Action Alternative. A cumulative total of 168.1 acres, or 0.85% of potential grazing would be lost to development under the Proposed Action. Implementation of the Proposed Action would have negligible impacts on ranching operations or grazing potential within the Unit. Reclamation of pipeline corridors would actually result in a net increase in grazing lands in the Unit through the conversion of unpalatable browse species to grasses and forbs.

**Alternative 1** – During production, the total amount of lost potential grazing would be 121.4 acres (0.62% of the Unit), or 0.02% less than the Proposed Action. Total lost irrigated pasture lands would comprise 7.7 acres, or 0.04% of the Unit (0.1% more than the Proposed Action). The types of short-term and long-term direct and indirect impacts would be the same as for the Proposed Action. Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to rangeland. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The types of cumulative impacts to rangeland from the implementation of Alternative 1 in combination with the No Action Alternative would be the same as for the Proposed Action. A cumulative total of 166.8 acres, or 0.85% of potential grazing would be lost to development under Alternative 1, which is similar to the Proposed Action.

**No Action** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would likely develop up to 55 new wells on fee surface. During

production, the total amount of lost potential grazing would be 80.3 acres (0.41% of the Unit), or 0.23% less than the Proposed Action. Total lost irrigated pasture lands would comprise 7.5 acres, or 0.04% of the Unit (0.6% less than the Proposed Action). The types of short-term and long-term direct and indirect impacts would be the same as for the Proposed Action. The types of short-term and long-term direct and indirect impacts would be the same as for the Proposed Action.

## **FIRE**

**Affected Environment:** The Bull Mountain Unit is located within the Ragged Mountain Fire District and is geographically located within Management Unit 16. The UBRMP calls for intensive suppression of fire on federally managed lands within this unit. Gunnison County regulations state that natural gas operations “shall not cause a significant risk of wildfire hazard.” With normal precipitation, the risk of wildland fire is thought to be minimal. Surface fuels in the Unit are dominated by generally continuous sagebrush fuels, with patches of decadent Gambel’s oak and mixed-shrub fuel types. The Colorado State Forest Service rates these sites as “Moderate Hazard” based on topography and fuel loading. Fires within these fuel types would be generally difficult to stop with hand-crews and Type 6 brush trucks, unless natural and man-made fuel breaks (roads, irrigated meadows, etc.) were utilized.

### **Environmental Consequences/Mitigation:**

**Proposed Action** – Well pad fires as a result of an explosion or ignition of natural gas are unlikely due to safety procedures and equipment standards. No flaring of the wells is anticipated, and if flaring is required, areas around the flare would be cleared of all vegetation. The operator would closely follow COGCC 600 Series Safety Regulations. This would include maintaining accessible fire extinguishers, fresh water, and hoses on-site; indoctrinating all on-site personnel regarding proper emergency procedures; and immediate closure of the site and notification of local emergency responders in the event of a fire or explosion. The operator’s Emergency Response Plan was developed to protect the health and safety of on-site personnel as well as to prevent the spread of fire to surrounding lands. The plan, which would be attached to the APDs for all wells and is on file with Gunnison County, includes detailed procedures for prevention and emergency response procedures. The short-term and long-term risk of fire or explosion on the well site, as well as fire escaping from the site onto public lands, would be low. Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts from fire. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – The cumulative impacts assessment area for fire is the Bull Mountain Unit and immediate vicinity. Any wildfire resulting from the Proposed Action is expected to be highly localized. Additional cumulative impacts are not anticipated.

**Alternative 1** – The risk of wildfire hazard on surrounding public lands due to natural or human causes would be the same for Alternative 1 as for the Proposed Action. Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts from fire. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts** – No cumulative impacts would be anticipated from the implementation of Alternative 1 in combination with the No Action Alternative.

**No Action Alternative** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would develop up to 55 new wells on 11 well pads on fee surface and would add up to 11 wells to existing well pads. Due to the lower number of well pads and wells that would be developed and produced under the No Action Alternative, and the fact that all development would be on fee lands, the risk of wildfire hazard on surrounding public lands due to natural or human causes would be virtually eliminated.



## HYDROLOGY AND WATER RIGHTS

**Affected Environment:** See the Water Quality, Surface and Ground section of this document for a complete discussion of surface and groundwater quality. Climate, temperature, precipitation, and evaporation and evapotranspiration discussions related to hydrology are summarized in the Water Resources Technical Report (WWC 2011).

The Bull Mountain Unit lies within the North Fork Gunnison River (North Fork) watershed (Hydrologic Unit Code [HUC] 14020004). The North Fork is a major tributary to the Gunnison River in the Upper Colorado River watershed (HUC 1402). The perennial East and West Muddy creeks (HUC 1402000409 and HUC 1402000455, respectively) and their intermittent and perennial tributaries drain the Unit. East and West Muddy creeks are tributaries to the North Fork.

**Surface Water:** Surface water features within the Unit include portions of 12 perennial streams, numerous intermittent streams, man-made reservoirs, and at least 17 natural springs (Figure 10). Surface water hydrology adjacent to and within the proposed project area is dominated by the southerly flowing East Muddy Creek and associated tributaries (HUC 1402000409) and the southeasterly flowing West Muddy Creek and associated tributaries (HUC 1402000455).

Flow rates within stream channels in the Unit correlate primarily to precipitation; increased surface runoff occurs in the spring as a result of snowmelt and rainfall and during the summer months following intense rainfall events. Approximately 80% of Colorado's water supply comes from melting snow (NFRIA 2010). Based on peak flow records from USGS gauging stations near the Unit (09131200, 09130500, and 09131500) the most probable month for runoff is May (USGS 2010b). Perennial and intermittent streams in the Unit also receive support from groundwater discharge to sustain flow. Rainfall events can cause large peak flows, although the duration of flow from rainfall is relatively short in comparison to snowmelt runoff. Because precipitation varies greatly from event to event and year to year, runoff volumes vary greatly as well.

There are no USGS gauging stations within the Unit although three stations are located nearby (Stations 09131200, 09130500, and 09131500). Station descriptions and condensed historical streamflow data recorded at these three stations (USGS 2010b) are as follow:

- USGS Station 09131200, West Muddy Creek near Somerset, Colorado. This site was maintained from 1961 through 1973 and was located on West Muddy Creek upstream of the confluence of West and East Muddy creeks, approximately 4 miles west of the Unit. The drainage area upstream of the gage is approximately 50 square miles. The mean monthly discharge rates for the entire data record at this location ranged from 5.0 cfs (January) to 167 cfs (May). The mean annual discharge rates recorded at this location ranged from 11.0 cfs (1963) to 59.1 cfs (1962). Instantaneous peak discharge rates recorded at this site ranged from 120 cfs (1972) to 1,190 cfs (1973).
- USGS Station 09130500, East Muddy Creek near Bardine, Colorado. This site was maintained from October 1934 through September 1953 and was located on East Muddy Creek just south of the Unit. The drainage area upstream of the gage is 133 square miles. The mean monthly discharge rates for the entire data record at this location range from 14 cfs (January) to 475 cfs (May). The mean annual discharge rates recorded at this location ranged from 53.7 cfs (1940) to 135.0 cfs (1938). Instantaneous peak discharge rates recorded at this site ranged from 480 cfs (1951) to 2,190 cfs (1941).
- USGS Station 09131500, Muddy Creek at Bardine, Colorado. This site was maintained from October 1949 through September 1955 and was located on Muddy Creek below Paonia Reservoir, approximately 5 miles south of the Unit. The drainage area upstream of the gage is 257 square miles. The mean monthly discharge rates for the entire data record at this location ranged from 21 cfs (December and January) to 642 cfs (May). The mean annual discharge rates recorded

at this location ranged from 48.9 cfs (1954) to 242.9 cfs (1952). Instantaneous peak discharge rates recorded at this site ranged from 382 cfs (1954) to 3,400 cfs (1952).

During periods of significant rainfall or snowmelt events, most of the streamflow within Muddy Creek and its tributaries is derived from surface runoff. Conversely, during periods in which there is no precipitation or snowmelt runoff, streamflow in the perennial streams is maintained by groundwater discharge (Taylor 1987). Given the arid climate in the area, it is estimated that 98% of the snowmelt and precipitation runoff in northwestern Colorado is lost to evapotranspiration (Taylor 1987).

There are a number of irrigation diversions off of the larger creeks, especially on the eastern side of the Unit (BLM 2010a). Stock ponds occur frequently on the landscape, and in general retain surface waters throughout the year.

Expansive irrigated hay meadows are generally found in the bottomlands of the East Muddy Creek drainage. Irrigated meadows are also found in the Ault Creek drainage at the far western side of the Unit (BLM 2010a). Natural flows of streams are likely affected by diversions for irrigation and there are numerous water rights for both reservoirs and irrigation diversions on North Fork Gunnison River (NFRIA 2010). Based on USGS estimates, approximately 3,000 acres of irrigated lands occur upstream of USGS gauging station 09132500 (North Fork Gunnison River Near Somerset, Colorado) (USGS 2010a). Irrigation diversions affect the intensity, quantity, and timing of streamflows within the North Fork Gunnison River. For example, in May when runoff is highest, irrigation diversions attenuate the peak flow by diverting it onto irrigated lands. Irrigation withdrawals sometimes reduce discharge in the North Fork Gunnison River to low volumes; during drought years, surface flow sometimes disappears from segments of the channel (NFRIA 2010). At certain points, such as through the town of Paonia, the river is almost completely diverted into irrigation ditches and metered at headgates (NFRIA 2010). According to the Colorado Division of Water Resources, there are 35 ditch-type water rights within the Unit. All but three of these ditches list Muddy Creek as the source. Permitted surface water rights on the Unit are summarized in the Water Resources Technical Report (WWC 2011).

Waters of the U.S. Waters of the U.S. include the territorial seas, interstate waters, navigable waterways (such as lakes, rivers, and streams), special aquatic sites, and wetlands that are, have been, or could be used for travel, commerce, or industrial purposes; tributaries, and impoundments of such waters. All channels that carry surface flows and that show signs of active water movement are Waters of the U.S. Similarly, all open bodies of water (except ponds and lakes created on upland sites and used exclusively for agricultural and industrial activities or aesthetic amenities) are Waters of the U.S. (EPA 33 CFR § 328.3[a]). Such areas are regulated by the EPA and USACE. Most of the surface water features in the Unit qualify as Waters of the U.S. Any activity that involves discharge of dredge or fill material into or excavation of such areas is subject to regulation by the USACE pursuant to Section 404 of the CWA. Activities that modify the morphology of stream channels are also subject to regulation by the Colorado Department of Public Health and Environment (CDPHE). Approximately 16.6 acres of wetlands and 6,200 feet of Other Waters of the U.S. would be disturbed by the Proposed Action. Special aquatic sites and wetlands are discussed in greater detail in the Wetlands and Riparian Zones section.

Surface Water Rights. Based on a review of the Colorado Division of Water Resources' surface water rights database, there are 75 permitted surface water rights within the Unit. The majority of the water rights (33) have a designated use that is (or includes) irrigation. Other uses include stock (19), fishery (18), domestic (14), recreation (12), wildlife (5), fire (5), federal reserve (4), storage (2), other (2), industrial (1), and augmentation (1). The sum of water rights uses is greater than 75 as some of the individual rights list multiple uses. Sources for these surface water rights within the Unit are as follows: Muddy Creek is the water source for 71, North Fork Gunnison River is the source for three, and Gunnison River is the source for one. Existing surface water rights within the Unit are tabulated in Water Resources Technical Report.

Groundwater. Groundwater resources in the Unit include Tertiary and Upper Cretaceous-age bedrock aquifer systems and Quaternary-age alluvial aquifer systems. Within the North Fork Gunnison River Basin, the thickness of the Upper Cretaceous aquifers varies from 250 to 4,500 feet (Ackerman and Brooks 1986). Alluvial aquifers are thickest in valley bottoms (usually less than 100 feet thick) and are likely connected hydraulically with adjacent bedrock aquifers. Groundwater in the bedrock aquifers flows in the direction of the geologic dip, approximately 4 degrees to the northeast (BLM 2007a). The geology of the area is complex due to the presence of sills, dikes, laccoliths, and igneous intrusions (Ackerman and Brooks 1986). The North Fork Gunnison River Basin is flanked by Grand Mesa on the north and the West Elk Wilderness area on the east and south. Natural recharge to the Tertiary and Upper Cretaceous aquifers within the Unit is primarily from winter snowpack in higher-altitude areas to the north, east, and south. A portion of the spring snowmelt infiltrates into these bedrock strata and the recharge volume increases with an increase in snowpack depth and is greater at higher altitudes (BLM 2007b).

The primary bedrock aquifers in the North Fork Gunnison River Basin are the Dakota Sandstone and the Burro Canyon Formation of Early and Late Cretaceous age (Ackerman and Brooks 1986). The Dakota Sandstone varies from 30 to 150 feet in thickness and the Burro Canyon Formation varies from 50 to 180 feet thick (BLM 2010b). Wells completed in these formations typically yield more than 10 gallons per minute (gpm) (Ackerman and Brooks 1986).

The Upper Cretaceous Mesaverde aquifer is regionally more extensive than the other bedrock aquifers in the area because none of the major river systems (i.e., the North Fork of the Gunnison, Colorado, or White Rivers) have eroded into it. Within the North Fork Gunnison River Basin, the Mesaverde aquifer includes the Lance Formation, the Fox Hills Sandstone (where it is present), the Lewis Shale, and the Mesaverde Group, which is composed of the Williams Fork Formation, the Trout Creek Sandstone Member, and the Iles Formation (Freethey 1991). The lithologic composition of the Mesaverde aquifer is very highly variable from formation to formation and from location to location due to the complex nature in which the strata were deposited. However, within the Piceance Basin, the Mesaverde aquifer is predominantly composed of sandstone with interbedded shale and coal beds. Within the North Fork of the Gunnison River Basin, the thickness of the Mesaverde aquifer varies between approximately 4,000 feet to 5,000 feet. Wells completed in the Mesaverde Formation have yields that are typically less than 10 gpm (Ackerman and Brooks 1986).

Underlying the Mesaverde aquifer is the Mancos shale. Within the Unit, the Mancos Shale is approximately 4,500 feet thick. The Mancos Shale is primarily marine shale, mudstone, and claystone; therefore, permeability is very low. Because of the low permeability within the Mancos Shale, it is considered a major confining layer that essentially stops all groundwater flow (Ackerman and Brooks 1986).

Alluvial deposits within the Unit primarily consist of sand, silt, and gravel of Quaternary age adjacent to the East Muddy Creek valley. Portions of the alluvial aquifers extend into the tributary valleys. Thin alluvial and eolian deposits are present on mesas near the site but none appear to be actually within the Unit (Ackerman and Brooks 1986). Wells completed in the alluvium have yields that can range from 1 to 150 gpm but generally average about 20 gpm (Ackerman and Brooks 1986).

#### Groundwater Rights

A Colorado Division of Water Resources records review revealed 66 current groundwater permits within the Unit. All of these groundwater permits are filed on water wells apportioned as follows: 20 domestic use; 15 domestic/stock use; 12 other use; 11 household use only; and eight industrial use. Of the 66 permitted wells, 50 wells are developed, no records of completion are available for 14 wells, and two permits were extended. Forty-eight of the 66 permitted wells report positive yields. Details on the permitted wells within the Unit are tabulated in Water Resources Technical Report (WWC 2011).

### **Environmental Consequences/Mitigation:**

See the Water Quality, Surface and Ground section of this document for analysis of potential impacts to water quality.

**Proposed Action – Surface Water.** Potential impacts to surface water resources from the Proposed Action include increased short-term runoff and depletion of surface water flows in East and West Muddy creeks, Muddy Creek, and possibly the North Fork Gunnison River. Impacts would likely be greatest shortly after the start of construction activities and would likely decrease in time due to natural stabilization and reclamation/revegetation efforts. Surface water quantity could also be affected by the water use requirements of the project.

The magnitude of impacts to surface water resources would depend on several factors, including the proximity of the disturbance to drainages or ponds, slope aspect and gradient, soil type, duration and timing of the construction activity, and the success or failure of mitigation. In an effort to locate potentially suitable sites within the Unit boundary and reduce impacts, SG utilized site-suitability models, which combined a number of data sets across a given area to produce a final composite that ranked the appropriateness of a site. The analyses utilized data sets to develop criteria for each site-suitability study, including the following parameters directly or indirectly related to hydrologic function:

- Slope (steepness of the terrain)
- Proximity to existing road networks
- Proximity to existing natural gas pipeline systems
- Proximity to delineated wetlands and wetland buffer zones
- Proximity to stream networks and stream buffer zones
- Soil erosion factors

After review of the compiled statistics, 50 well pad locations with the best suitability values, the least amount of road construction, and that minimized hydrologic impacts were chosen as a foundation for the Proposed Action.

Clearing, grading, trenching, and soil stockpiling activities could temporarily alter overland flow patterns. Near-surface soil compaction caused by construction equipment and vehicles could reduce the ability of soil to absorb water and could increase the potential for surface runoff and ponding.

Impacts would be greatest immediately following commencement of construction activities and would naturally decrease thereafter due to soil stabilization efforts and reclamation/revegetation of disturbance areas.

Water would be used by the project during construction activities for drilling, dust control, hydraulic fracturing, and hydrostatic testing of the pipelines. Under the Proposed Action:

- Drilling activities would be completed in approximately 6 years. It is estimated that drilling operations (drilling, cementing, and hydraulic fracturing) would use 635 ac-ft per year based on three drilling rigs drilling an estimated nine wells each, or a total of 27 wells per year. Well pad construction would require approximately 29 ac-ft of water per year. The estimated annual water use for all drilling/completion is 664 ac-ft.
- Road/pipeline construction (including 0.5 ac-ft for pressure testing) would require approximately 63 ac-ft of water over the construction phase. For estimation purposes (based on a 6-year drilling schedule) the annual water use for road/pipeline construction would be approximately 11 ac-ft. It is likely that a majority of the road/pipeline construction would be completed ahead of the drilling.
- Total annual water use for construction and drilling operations is estimated to be 675 ac-ft. SG estimated that approximately 70% of the water needed for drilling operations could come from

recycled hydraulic fracturing fluid or reused produced water, which translates to approximately 203 ac-ft of other water needed annually for 6 years for the project.

Based on data from USGS gauging station 09130500, the mean annual discharge rate of East Muddy Creek near Bardine (1935-1953) varied from a low of 54.0 cfs (39,066 ac-ft per year) in 1940 to a high of 135.0 cfs (97,504 ac-ft per year) in 1938. Therefore, if water needed for the Proposed Action were removed directly from East Muddy Creek, maximum water depletion for East Muddy Creek would range from about 0.5% of the average annual discharge during a dry year to 0.2% of the discharge during a wet year. SG has secured already appropriated water for this project; as such, no “new” water would be depleted from the Muddy Creek system as a result of the construction and drilling phase of this project.

At this time, SG has one water reinjection (disposal) well in operation (Federal 24-2 WDW). As part of natural gas development in the area, SG intends to install four additional produced-water disposal wells. The construction disturbance associated with five injection wells would be 17.5 acres, 3.5 acres for each disposal well pad. Potential impacts to surface water quality due to injection well development would include increased turbidity and sedimentation in watercourses, increased short-term runoff, and increased salt loading due to this additional disturbance. Impacts to surface water may also occur due to unintentional produced-water spills from produced-water pipelines and storage tanks. The risk of spillage increases somewhat over time as facilities age and with a higher density of pipelines over the life of the field. Spill risk can be reduced through berming, facility location, monitoring, and equipment maintenance programs.

Approximately 12.2 miles of new access roads and 22.1 miles of new pipeline are planned under the Proposed Action. Approximately 11.4 miles of the new pipelines would be co-located with roads. The construction of the new roads and pipelines would result in 17 perennial stream crossings and 41 intermittent stream crossings. The road/pipeline crossings would result in a permanent alteration of channel shape. Due to the flashy nature of these tributaries, the crossings may impact runoff patterns. In the short term, construction disturbances associated with the crossings are expected to increase the turbidity, sedimentation, and salt loading within the channels. During production, these potential impacts would be minimized as the roadway/pipeline corridors are stabilized by revegetation and as the road surfaces are paved. Additional surface disturbances would only occur during major maintenance activities.

Approximately 16.6 acres of wetlands and 6,200 feet of Other Waters of the U.S. would be disturbed by the Proposed Action. Special aquatic sites and wetlands are discussed in greater detail in the Wetlands and Riparian Zones section. Any activities that involve discharge of dredge or fill material into or excavation of such areas are subject to regulation by the USACE pursuant to Section 404 of the CWA. Activities that modify the morphology of stream channels are also subject to regulation by the CDPHE.

Surface Water Rights. Under the Proposed Action, SG would use water for drilling, dust control, hydraulic fracturing, and hydrostatic testing of the pipelines. Potential impacts to water rights users would be a decrease in the available water supply in Muddy Creek due to water being used for SG’s industrial activities. Water needed for construction/drilling activities would be obtained from nearby sources (per surface-use agreements with landowners), and would be under the guidance of SG’s Water Augmentation Plan granted by the District Court – Water Division 4 (Case # 09CW16), and regulated through the State Division of Water Resources (Water Division 4). If necessary, water would be purchased and trucked in from private and/or other sources near Paonia or Somerset.

The BLM will implement an instream flow requirement on the Muddy Creek below the confluence with East and West Muddy creeks. The purpose of this requirement is to protect and perpetuate beneficial uses for tributaries to North Fork Gunnison River, including Muddy Creek, as designated by the Colorado Department of Public Health and Environment. The designated beneficial uses include Aquatic Life Cold 1, Recreation E, Water Supply, and Agriculture. It is anticipated that the instream flow requirement will be implemented only in rare occasions, because as specified above, SG intends to utilize wells and its

existing surface water rights to meet to meet water demands before implementing any new surface water diversions from tributaries to Muddy Creek.

Unless petitioned for inclusion as a nontributary groundwater and approved by the Colorado State Engineer, all groundwater in Colorado is presumed to be tributary; water that is hydrologically connected to surface water and subject to administration under the prior appropriation surface water rights system. Pursuant to 37-92-308(4) or 37-92-308(5), an operator producing non-coalbed natural gas tributary groundwater must operate according to a water-court approved plan of augmentation or a substitute water supply plan (CDWR 2010b). Also, prior to removing tributary groundwater, an operator must first obtain a groundwater well permit from the Colorado State Engineer for beneficial use. This ensures that the well will not cause injury to vested surface water rights (CDWR 2010c). Produced water associated with the proposed project would be removed from Mesaverde Group and Mancos Shale aquifers to facilitate the natural gas recovery process. According to Colorado State Engineer, the Mesaverde Formation aquifer has been designated as a nontributary groundwater within the project area and the Mancos Shale aquifer is classified as a tributary groundwater within the project area (CSOS 2010). As such, the process of removing produced water from the Mancos Shale aquifer would be performed under the guidance of a water augmentation plan granted by the District Court – Water Division 4, and regulated through the State Division of Water Resources (Water Division 4). If withdrawals from the Mancos Shale aquifer impacted surface water rights, the water augmentation plan would be invoked. Water from private sources near Paonia or Somerset would be used to augment surface flows in Muddy Creek to mitigate impacts due to tributary groundwater withdrawals from the Mancos Shale aquifer.

Groundwater. Construction activities may disrupt natural surface and groundwater flow patterns. Altered flow patterns could disrupt natural surface and groundwater recharge/discharge patterns. Changes to natural recharge/ discharge patterns could have adverse impacts on stream channel morphology, productivity of springs, riparian areas, and aquatic life.

A majority of the project facilities are in the areas where no alluvium is present, but several well sites are located on alluvial deposits. Also, the Wasatch Formation, which crops out and is widely distributed across the Unit, consists of permeable strata and also has some secondary permeability from fractures and jointing and could therefore provide hydraulic communication to the alluvial aquifer.

Nine wells completed by SG as CBNG wells (permitted through COGCC) have been permitted through the Colorado Division of Water Resources as industrial use wells for removal of water to facilitate oil and gas production. Groundwater from one or more of the nine wells in the vicinity of the Unit could be used for the daily operation of the facility if a new water well permit is obtained through CDWR for use at the facility.

The proposed roadways would cross named perennial streams and named and unnamed intermittent tributaries to East and West Muddy creeks. Road construction could alter natural groundwater recharge patterns along the tributaries.

SG estimates that at full project build-out between 2,500 and 15,000 bbls per day (118 and 706 ac-ft/year) of produced water would be removed from the Mesaverde Group and Mancos Shale aquifers to facilitate the natural gas recovery process. The target depths of the proposed natural gas production wells would vary by well site, but are estimated to be between 5,000 and 10,000 feet. The deepest non-industrial designated use well within the Unit is 460 feet. Due to the depth separation between SG's proposed production wells and existing non-industrial use water wells, non-target aquifers in the area should not be impacted by the removal of water resulting from the Proposed Action.

As part of natural gas development in the area, SG intends to install four additional Class II produced water injection wells for a total of five injection wells. All produced water not recycled and reused for drilling/completion operations would be reinjected into the five water disposal wells. The primary disposal zones for the proposed injection wells are the Dakota Sandstone, Morrison Formation, Entrada Sandstone, or Maroon Formation at depths between 9,300 and 9,500 feet. The TDS concentration

measured in an existing injection well (Federal 24-2 WDW), completed in the Unit in the Permian-Pennsylvanian age Maroon Formation, is 18,962 mg/L. Other water quality parameters for this well were not available. TDS concentrations from produced water from existing natural gas wells within producing formations in the Unit range from 4,495 mg/L to 18,445 mg/L (Table 42). Due to the depth separation between SG's proposed injection wells and existing non-industrial use water wells, non-target aquifers in the area should not be impacted by the Proposed Action. Based on limited water quality data, the zones targeted for reinjection of produced water will likely have poor water quality and will not be adversely impacted by the injection of the produced water.

**Groundwater Rights.** Under the Proposed Action, SG would use water for drilling, dust control, hydraulic fracturing, and hydrostatic testing of pipelines. Potential impacts to groundwater rights would include a potential decrease in the amount of groundwater available due to groundwater withdrawals for development. The only proposed groundwater withdrawals within the Unit as a result of the Proposed Action would be associated with produced water from natural gas production wells. The target depths of the proposed natural gas production wells would vary by well site, but are estimated to be between 5,000 and 10,000 feet. Due to the depth separation between SG's proposed production wells and existing non-industrial use water wells (the deepest non-industrial designated use well within the Unit is 460 feet), domestic/stock groundwater rights in the area should not be impacted by the Proposed Action. CDRW requires natural gas wells permitted through the COGCC also be permitted for industrial use for removal of produced groundwater associated with oil and gas exploration and production. Additional groundwater removed from targeted aquifers as a result of the proposed project would not adversely impact the industrial wells permitted in the Unit.

Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to hydrology and water rights for both surface and groundwater. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts: Surface Water Hydrology** – Cumulative impacts to surface water would be limited to the surface water features within the same watersheds that are affected by the Proposed Action. Potential cumulative impacts to surface water resources from the Proposed Action include increased turbidity and sedimentation in water courses, short-term runoff, salt-loading, contamination of surface water courses and ponds by produced water and petroleum, depletion of surface water flows in nearby streams, and impacts to Waters of the U.S./wetlands. A complete discussion of water depletion and the BLM's fluid minerals program in the Colorado River Basin in Colorado is provided in the Water Quality section of this EA.

Construction of the Proposed Action would have temporary impacts on Other Waters of the U.S. and wetlands. No wetlands would be permanently filled or drained as a result of the Proposed Action, Alternative 1, and No Action Alternative. Any activities that involve discharge of dredge or fill material into or excavation of such areas are subject to regulation by the USACE pursuant to Section 404 of the CWA. Activities that modify the morphology of stream channels are also subject to regulation by the CDPHE. Cumulative impacts would occur where the reasonably foreseeable future projects are constructed adjacent to the Unit, but the impacts would be temporary until wetland vegetation returned to pre-construction levels. Cumulative impacts would be minimized by implementing measures to lessen the duration of disturbance, reduce the soil disturbance, and enhance restoration.

**Groundwater Hydrology.** Cumulative impacts to groundwater would be limited to the groundwater aquifers that are affected by the Proposed Action, Alternative 1, and No Action Alternative, and are discussed in detail in the Water Resources section.

**Surface Water Rights.** Cumulative impacts to surface water rights would be limited to the surface water rights within the same watersheds that are affected by the Proposed Action, Alternative 1, and No Action Alternative. Potential cumulative impacts to surface water rights from the Proposed Action, Alternative 1, and No Action Alternative include a decrease in the available water supply in Muddy Creek and downstream surface flows due to water depletion. Cumulative impacts to surface water flows would be



mitigated by obtaining water from nearby sources (per surface-use agreements with landowners). Water augmentation plans (granted by the District Court and regulated through the State Division of Water Resources) would also offset water depletions resulting from natural gas development. If necessary, water would be purchased and trucked in from private and/or other sources located near Paonia or Somerset.

According to Colorado State Engineer, the Mesaverde Formation has been designated as a nontributary groundwater within the project area and the Mancos Shale aquifer is classified as a tributary groundwater within the project area and subject to administration under the prior appropriation system (CSOS 2010 and CDWR 2010c). As such, any produced water removed from the Mancos Shale aquifer would be under the guidance of a water augmentation plan granted by the District Court – Water Division 4, and regulated through the State Division of Water Resources (Water Division 4). If withdrawals from the Mancos Shale aquifer impacted surface water rights, the water augmentation plan would be invoked. Water from private sources near Paonia or Somerset would be used to augment surface flows in Muddy Creek to mitigate impacts due to tributary groundwater withdrawals from the Mancos Shale aquifer.

**Groundwater Rights:** Cumulative impacts to groundwater would be limited to the groundwater aquifers that are affected by the Proposed Action. Potential impacts to groundwater rights would include a possible decrease in the amount of groundwater available due to groundwater withdrawals for natural gas development. The target depths of the proposed natural gas production wells would vary by well site, but are estimated to be between 5,000 and 10,000 feet. Due to the depth separation between potential production wells and existing non-industrial use water wells, domestic/stock/irrigation groundwater rights in the area should not be impacted by cumulative groundwater removal associated with natural gas development in the area if proper well drilling procedures and completion techniques are utilized. CDRW requires natural gas wells permitted through the COGCC also be permitted for industrial use for removal of produced groundwater associated with oil and gas exploration and production. Cumulative groundwater removed from targeted aquifers as a result of the natural gas development would not adversely impact the industrial wells permitted in the area.

**Alternative 1 –** Alternative 1 would require 3.3 fewer mile of new or improved access roads and 4.5 fewer acres of new production surface disturbance as compared to the Proposed Action, and would place development higher on ridges and side-slopes (Figure 5). Disturbance from Alternative 1 would cross fewer perennial streams (16 vs. 17) and intermittent streams (30 vs. 41), and impact more acres of wetlands (19.4 vs. 16.6). Adherence to applicable BMPs listed in Appendix C would minimize the potential for impacts to hydrology and water rights for both surface and groundwater. In addition, BLM may attach site-specific COAs to the APDs.

**Cumulative Impacts –** The types of cumulative impacts to hydrology and water rights from the implementation of Alternative 1 in combination with the No Action Alternative would be the same as for the Proposed Action. Compared to the Proposed Action, there would be 4.5 fewer acres of production disturbance and fewer total stream crossings.

**No Action –** Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. Production and operation of existing federal and fee/fee wells would continue under the No Action Alternative and SG would likely develop and produce up to 55 additional natural gas wells on fee surface. The No Action Alternative would require 9.3 fewer miles of new access roads and 45.6 fewer acres of new production surface disturbance as compared to the Proposed Action. The types of impacts would be similar to those described for the Proposed Action and Alternative 1.

## NOISE

**Affected Environment:** Noise is generally described as unwanted sound and is measured as sound pressure in units of decibels (dBAs). The decibel scale is logarithmic, or non-linear, because the range of sound that can be detected by the human ear is so great that it is convenient to compress the scale to encompass all the sounds that need to be measured. Each 20-unit increase in the decibel scale increases the sound loudness by a factor of 10.

The Unit is within a rural agricultural area that includes a mix of farming and ranching properties and 45 habitable dwellings. Noise levels from human activity are mostly mechanical, consisting mainly of existing natural gas development, new exploration activities, and ranching/farming activities. Ambient levels range from 35–40 dBA increasing up to 60 dBA with traffic from local roads (American Speech and Hearing Association, ASHA, 2008). As a basis for comparison, the noise level during normal conversation of two people 5 feet apart is 60 dBA. The varied terrain and vegetation within the Unit provide barriers and buffers for noise.

Noise from natural gas development within the Unit comes from a number of sources: truck traffic, drilling and completion activities, and well pumps. No compressor stations are currently present in the Unit, and none are proposed. Table 48 summarizes noise levels of typical construction equipment.

**Table 48. Noise Levels Associated with Typical Construction Equipment**

Equipment	Noise Level in dB(A)		
	50 feet	500 feet	1,000 feet
Tractor	80	60	54
Bulldozer	89	69	63
Motor grader	85	65	59
Mechanic truck	88	68	62
Backhoe	85	65	59
Crane	88	68	62
Air compressor	82	62	56
Dump truck	88	68	62
<b>Average, nearest dB(A)</b>	<b>86</b>	<b>66</b>	<b>60</b>

Source: La Plata County, 2002.

The BLM does not have established noise standards for this area, and the Gunnison County Temporary Regulations for Oil and Gas Operations do not contain specific standards for noise. In 2006, the COGCC established regulatory limits as summarized in Table 49.

**Table 49. Regulatory Limits for Noise Generated by Natural Gas Facilities**

Zoning Area	7 a.m. to 7 p.m	7 p.m. to 7 a.m
Residential	55 db	50 db
Light industrial	70 db	65 db

In remote areas, with no nearby occupied structures, the light industrial standard may be applied. These levels would be measured 350 feet from the source of the noise. Sound levels would be measured 25 feet from an existing residence if the residence is less than 350 feet from the noise source. Maximum levels may be exceeded by 10 dB(A) for up to 15 minutes within any one-hour period during daytime hours. Periodic, impulsive, or shrill noise may exceed the stated levels by 5 dB(A) day or night.

#### **Environmental Consequences/Mitigation:**

**Proposed Action** – Noise levels would temporarily increase near the area of activity during construction, drilling, and workover. Operation of project-related vehicles and heavy equipment would generate noise during well pad and access road construction, and noise levels could exceed 70 dB(A) for a few minutes at a time between 7:00 a.m. and 7:00 p.m. Well pad and access road construction activities would cease after 7:00 p.m. Well drilling operations would continue 24 hours a day. Construction-related vehicles and maintenance trucks would create transient sources of noise.

The COGCC conducted surveys of noise generated by various types of equipment used for drilling and production of natural gas in 2006. The high for operation of drilling rigs ranged from 45–68 DB, which is within the maximum range established by the COGCC.

Operational activities would generate noise from the use of electric and natural gas-fired pumps. The COGCC 2006 surveys showed a high of 37–47 dBA for electric pumps and 38–70 dBA for gas-fired pumps. Of the 37 sites surveyed for gas-fired pumps, three exceeded 60 dBA, and the majority ranged from 40–57 dBA. Electric pumps would be used for the water disposal wells, and gas-fired pumps would be used for the gas wells. In addition, two 600-hp natural-gas-fired screw compressors would be installed, one on private property in a central location within the Unit, and the other at the southern terminus of the Bull Mountain Pipeline just outside the Unit. Screw compressors typically produce high-frequency sound, and SG will install hospital-grade mufflers to minimize the noise from these units.

The nearest dwelling to a proposed well site is approximately 695 feet from the FED 11-89-31 #1. All other dwellings would be at least 1,100 feet away, with varying levels of vegetation and natural terrain providing a sound buffer. Short-term direct and indirect impacts to ambient noise levels within the project area during construction and development would be low to moderate, and below maximum COGCC standards. Long-term impacts from operation would be moderate. Adherence to applicable BMPs as described in Appendix C would minimize impacts from noise. BLM may attach additional site-specific COAs to the APDs.

**Cumulative Impacts** – The cumulative impacts assessment area for noise is considered to be the Bull Mountain Unit and immediate vicinity. Noise would continue to be generated by Unit operations for the life of the field. Cumulative impacts of the Proposed Action in combination with the No Action Alternative would include the addition of development- and production-related noise sources to those that already exist within the Unit. These noise sources include, but are not limited to: existing traffic and equipment noise from natural gas development and well maintenance, agricultural activities, and recreational and tourist traffic on SH 133 and CR 265. In some areas the density of development could be considered by some individuals to be “noisy.” This continual (though likely low-level) noise may be disruptive or objectionable to individuals such as recreationists, hunters, and livestock operators and may result in displacement of such activities. Displacement of wildlife in general and sensitive wildlife species may also occur in “busy” or “noisy” areas within the Unit; refer to the Wildlife and Special Status Species sections for this discussion. Short-term cumulative impacts from noise would be low to moderate during the construction and development phase, fluctuating with the specific activity. Long-term cumulative impacts would be low, and would also fluctuate with the specific activity.

**Alternative 1** – Direct and indirect impacts from noise would be increased for a cluster of 4 dwellings under Alternative 1 as compared to the Proposed Action. This cluster is located in an area ranging from 236 to 452 feet from the proposed ALT 12-89-9 #1, with varying levels of terrain and vegetation to buffer sound. In addition, a single dwelling is located approximately 311 feet from the proposed ALT 11-89-20 #1. For each of these dwellings, short-term direct and indirect impacts to ambient noise levels would be moderate but within maximum COGCC standards. Long-term noise levels during operations would be low for the majority of the project area and low to moderate for the dwellings discussed above. Adherence to applicable BMPs as described in Appendix C would minimize impacts from noise. BLM may attach additional site-specific COAs to the APDs.

**Cumulative Impacts** – The types of cumulative impacts from noise due to the implementation of Alternative 1 in combination with the No Action Alternative would be the same as for the Proposed Action. However, Alternative 1 would have 3.3 fewer miles of new or improved access roads than the Proposed Action, with proportionately less impacts during construction and corresponding reductions in vehicle traffic and noise during construction and production.

**No Action Alternative** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would develop up to 55 new wells on 11 well pads on fee

surface and would add up to 11 wells to existing well pads. Direct and indirect impacts from noise would be increased for 2 groups of dwellings as compared to the Proposed Action. A cluster of 3 dwellings is located between 387 and 769 feet from the existing Pasco Spadafora #2; two more dwellings are located at 475 and 834 feet, respectively, from the existing FSB 11-90-12 #1. All have varying degrees of terrain changes and vegetation to provide sound buffering. For these dwellings, short-term direct and indirect impacts to ambient noise levels would be moderate but within maximum COGCC standards. Long-term impacts from operation would be moderate.

## RECREATION

**Affected Environment:** The Unit is accessed from SH 133, along the West Elk Loop Scenic Byway, and CR 265. The West Elk Loop Scenic Byway passes through the proposed project area on SH 133 and connects the town of Carbondale, Hotchkiss, Crawford, Gunnison, Crested Butte, and other towns. In addition to attracting tourists, SH 133 provides access to hiking, mountain biking, dispersed camping, viewing of seasonal colors, cross-country skiing, and snowmobiling. The byway is known for its history, showcasing towns of varied lifestyles, and natural beauty. This route also provides access to the White River and Gunnison National Forests, the Black Canyon of the Gunnison National Monument, Gunnison Gorge National Conservation Area, Curecanti National Recreation Area, and Crawford and Paonia State Parks.

CR 265 provides access to the Grand Mesa, Uncompahgre, and Gunnison National Forest, which is extensively utilized for fall big game hunting, summer camping, viewing of seasonal colors, and snowmobiling.

Paonia State Park is located in close proximity to SH 133 and provides developed campsites, picnic sites, and a boat ramp surrounding Paonia Reservoir. McClure Pass is also in the vicinity and provides access to hiking, horseback riding, fishing, skiing, and snowshoeing and is a popular area with locals seeking nearby recreation opportunities.

The project area consists primarily of private surface that has historically been used for agriculture and grazing, with seasonal hunting. Hunting on private lands is permitted through local outfitter-guide services located in Crested Butte, Paonia, and Hotchkiss. Most of the larger private ranches in the Unit allow hunting with a ranch-approved guide, or at a minimum through the payment of a fee to the landowner. SG is currently required to negotiate with landowners on a case-by-case basis if drilling or construction activities need to continue into the hunting season; landowners are sometimes compensated for lost hunting revenue by payment of a fee, based on the period of time and amount of area impacted.

### Environmental Consequences/Mitigation:

**Proposed Action** – Impacts to recreational use would include short-term and long term visual impacts, as well as a low to moderate increase in the ambient level of noise from construction, drilling, and completion activities. This may affect the quality of experience for hunters and recreational users along the West Elk Loop Scenic Byway. Adherence to applicable BMPs as described in Appendix C would minimize impacts to recreation from noise, construction, and drilling. No mitigation measures specific to recreation would be required.

**Cumulative Impacts** – The cumulative impacts assessment area for recreation is considered to be the Bull Mountain Unit and vicinity. Cumulative impacts to recreation would occur from the reasonably foreseeable implementation of the No Action Alternative along with either the Proposed Action or Alternative 1. These activities, when added to other reasonably foreseeable natural gas and coal mining development activities in the area, would incrementally decrease the overall experience for recreational users. The primary user group impacted would be people using the West Elk Loop Scenic Byway, people viewing seasonal colors, and hunters.

**Alternative 1** – Impacts to recreational use under Alternative 1 would be similar to the Proposed Action, with a slight reduction in visual and noise impacts due to the more clustered configuration of

wells around existing roads. Adherence to applicable BMPs as described in Appendix C would minimize impacts to recreation from noise, construction, and drilling. No mitigation measures specific to recreation would be required.

**Cumulative Impacts** – The types and levels of cumulative impacts to recreation from the implementation of Alternative 1 in combination with the No Action Alternative would be the same as for the Proposed Action. However, Alternative 1 would have 3.3 fewer miles of new or improved access roads than the Proposed Action, with proportionately less impacts during construction and corresponding reductions in noise during construction and production.

**No Action Alternative** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would develop up to 55 new wells on 11 well pads on fee surface and would add up to 11 wells to existing well pads. Direct and indirect impacts from noise would be increased for 2 groups of dwellings as compared to the Proposed Action. The overall reduction in the number of wells and access roads to approximately 44% of the Proposed Action would proportionately reduce the potential for visual and noise impacts to recreation.

## VISUAL RESOURCES

**Affected Environment:** The scenic quality rating unit encompassed the rolling foothills to the northwest of the Ragged Mountain range, which holds a highly diverse landscape with a high amount of visual variety. Vertical relief is present, with high, rolling hills and fairly steep slopes. It is substantially natural in character, with few human intrusions creating a visual imprint on the land. The vegetation is vibrant and healthy, displaying as much or more diversity than seen in comparable areas in the west, resulting in brilliant seasonal color variation.

The BLM utilizes the Visual Resource Management (VRM) system to manage and protect visual/scenic resources. VRM cannot occur in a systematic and objective manner without a proper inventory of visual resources. An accurate inventory of visual resources creates the needed baseline data to conduct VRM. The Visual Resource Inventory (VRI) is a methodical process intended to evaluate and determine the quality of visual resources and the value of those resources in a given area. A VRI was completed for the UFO in September of 2009. While not yet incorporated into the current RMP, this data is the most recent and comprehensive data available for visual resources within the UFO.

The proposed facilities occur on a mixture of private surface/private minerals, private surface/federal minerals, and federal surface/federal minerals. While VRM objectives do not apply to non-BLM lands, visual concerns may be addressed on split estate where federal minerals occur.

VRI Classes are rated as: Class I, Class II, Class III, or Class IV. Class I is the highest value and is assigned to areas with special designations such as a Wilderness Area. Class II is the next most valued and allows for some management activities, but should not attract the attention of a casual observer. Class III allows for management activities that may attract attention, but shall not dominate the view of the casual observer. Class IV is for lands with the least value in scenic quality and allows for management activities that may dominate and be a major focus of attention.

All BLM land within the project area rates as VRM Class II. The management objective for this class is *“to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Visual resources on lands designated as Class II shall be managed to have a low level change and they shall retain the existing character of the landscape through repetition of the form, line, color and texture. Management activities may be seen, but should not attract the attention of the casual observer.”*

A VRI is comprised of three parts: Scenic Quality Evaluation, Sensitivity Level Analysis, and a delineation of Distance Zones. These three factors are combined to define the VRI Classes for the study area. Information for each of these three factors as they pertain to the planning area is as follows:

Scenic Quality Evaluation: The planning area is within the Bull Mountain Scenic Quality Rating Unit. Landform/water, vegetation, and structures were reviewed and described in the context of form, line, color, and texture as part of the field inventory. In addition, landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications were rated between 0 and 5, with 0 being a low rating and 5 being a high rating. The scenic quality rating values resulted in a Class A designation indicating a high and unique scenery value. The unit was given this rating due to the variety and seasonal color variation of vegetation, the adjacent scenery provided by the Ragged Mountain Range as well as the presence of flowing water. The rating documentation also notes that this unit provides a very diverse and vibrant vegetative community, considerable visual variety in terms of color, and that it is a very scenic landscape.

Sensitivity Level Analysis: This area is also referred to as Bull Mountain for the Sensitivity Level Rating Unit. During the VRI analysis, it was noted that this area had a high sensitivity in all categories, with a particular note of high public sensitivity to preserving the rural character and open space of the area, as well as the presence of the West Elk Loop Scenic Byway and the volume of tourist traffic and visitor use. The area attracts the notice of conservation groups concerned about energy development.

Distance Zone: The land within the planning area is all within the foreground/middleground distance zone (0-5 miles) which means the landscape can readily be seen and experienced from a major travel route or point. The primary travel routes within the planning area are SH 133 and CR 265.

The West Elk Loop Scenic Byway passes through the proposed project area on SH 133 and connects the towns of Carbondale, Hotchkiss, Crawford, Gunnison, Crested Butte, and other towns. The byway is known for its history, showcasing towns of varied lifestyles, and natural beauty. This route also provides access to the White River and Gunnison National Forests, the Black Canyon of the Gunnison National Monument, Gunnison Gorge National Conservation Area, Curecanti National Recreation Area, and Crawford and Paonia State Parks.

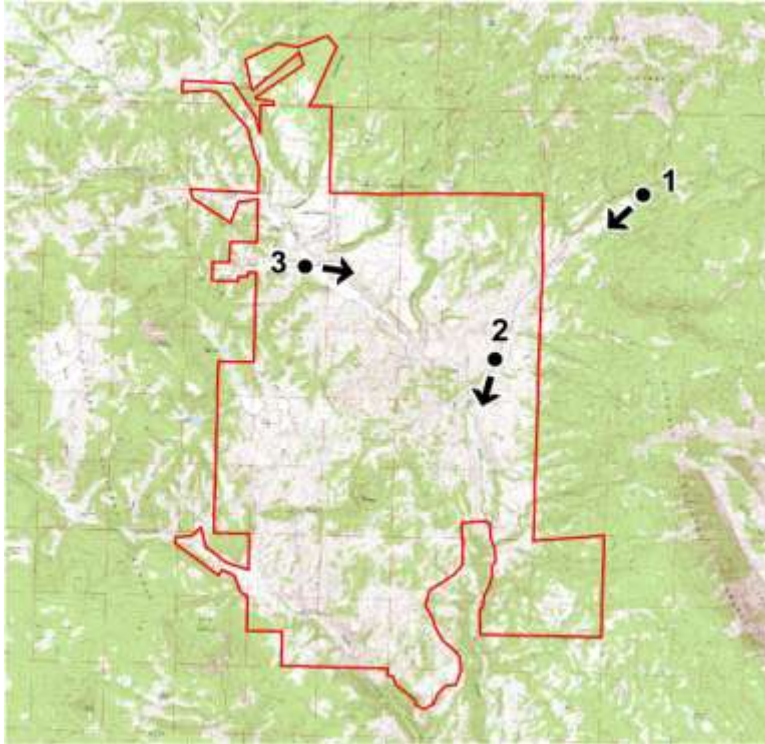
In addition, the Delta County Master Plan notes the presence of the Scenic Byway and the protection and interpretation of the cultural heritage and natural resources in the area. The Delta County Master Plan also states the following goal:

The preservation of the rural lifestyle and landscape, which includes the natural environment and unique physical characteristics of Delta County. Natural resources associated with the rural landscape include open space and scenic viewsheds, and includes a desired strategy to map the significant physical features and environmental characteristics of the County, such as important scenic viewsheds.

The Town of Paonia has also developed a SH 133 Corridor Master Plan which specifically states as a goal that *“The open scenic character of the West Elk Scenic Byway shall be protected.”* It states that new development should not detract from the rural qualities of the highway corridor and Paonia’s small-town character.

The analysis for visual resources places an emphasis on the SH 133 viewshed due to the added sensitivity of it being a scenic byway. The viewshed is comprised of the rolling foothills and valleys below and to the north of the Ragged Mountain range and west of McClure Pass. Numerous shrub species thrive with open meadows weaving in between large stands of woodlands comprised of aspen, juniper, and oak, along with a few groups of coniferous trees. The viewshed is most open and exposed as the traveler comes down McClure Pass, moving west along SH 133. As the highway begins to drop, the viewshed begins to narrow and is limited by the valley walls of Muddy Creek and the North Fork of the Gunnison River.

CR 265 has less traffic, and is primarily used for local use, with some regional access. This road follows a drainage, which limits its viewshed expanse to the immediate foreground due to the topography.



**Figure 11. IOP Locator Map, Bull Mountain Unit**

Inventory Observation Points (IOPs) from the recent VRI are included to show the representative character of the existing landscape. These three points show different areas of the scenic quality rating unit (Figure 11).

In addition, due to the sensitivity of the SH 133 corridor a Key Observation Point (KOP) was selected, representing a view while traveling SH 133 west of McClure Pass. KOPs are the most critical viewpoints of a Proposed Action, and are usually located along commonly traveled routes or at other likely observation points.



**IOP 1. Looking southwest**





**IOP 2. Looking south-southwest**



**IOP 3. Looking east-southeast**



**KOP 1: Represents the view while traveling SH 133 west of McClure Pass (Photo taken October 2007)**

## **Environmental Consequences/Mitigation:**

**Proposed Action** – Some of the proposed facilities would not be visible due to the terrain and the placement of the well pads and linear disturbances fit within the landscape. Due to the sensitivity associated with the SH 133 corridor, facilities seen from this location have a higher concern level.

Well Pad Sites: Within the SH 133 viewshed, a total of four well pad sites would have visible surface disturbance and above-ground facilities, and five additional well pad sites with visible above-ground facilities. All nine of the well pad sites with visible disturbance are on fee surface/federal minerals. The four well pad sites with visible surface disturbance represent approximately 14 acres of construction disturbance (using an average of 3.5 acres per well pad) and 5.52 acres of production disturbance (using an average of 1.38 acres per well pad).

Outside of the SH 133 viewshed there will be additional well pad sites visible from existing roads, notably CR 265. Of the remaining well pad sites, 31 of these well pads are on fee lands/federal minerals, with the remaining two sites straddling fee/fee and fee/federal. Some of the well pad sites may not be visible due to their placement within the landscape that will use the natural lines of the topography and vegetation to screen visual impacts. Additionally, other sites will only have visible facilities, which are easier to mitigate through proper placement and color treatment. In order to accurately analyze and quantify impacts, site specific plans need to be provided detailing the location of the pad a facilities as well as the amount of cut-and-fill.

Linear Disturbance (Access Roads and Pipelines): Linear disturbances have the potential to create greater visual disharmony than the disturbance from the surface of a well pad if not designed correctly. Within the viewshed of the SH 133 corridor there are several proposed pipelines and roads, both new and improved that could have a significant impact on the scenic quality of the area and may not meet the criteria of Class II. New roads, pipelines, and even improved roads may create visible disturbance through the exposure of cut-and-fill slopes and the clearing of vegetation, especially alignments that run perpendicular to the existing contours in the landscape instead of following and blending with them. Depending on the type of vegetation the linear disturbance is impacting, the disturbance may be long-term (trees and large shrubs) or short-term (grass).

The following are the estimated miles of linear disturbance within the SH 133 viewshed:

- Improved existing two track      1.3 miles
- New road      1.2 miles
- Pipeline co-located with roads      0.5 mile
- New pipeline      2.4 miles

The total disturbance would be approximately 5.4 miles of visible disturbance due to linear facilities, some of which may be able to be mitigated through proper design and placement. Specific plans would need to be provided for each alignment in order to properly analyze if they will meet the Class II requirements.

Outside of the SH 133 viewshed there would be additional impacts from linear alignments, although some of the disturbance may not be visible due to placement within the landscape that will use the natural lines of the topography and vegetation to screen visual impacts.

Overhead Electric Lines: The impacts from overhead lines may also create visible disturbance by introducing a line into the landscape that does not follow the contours of the land and is visually discordant with the surrounding landscape. In addition, depending on the materials used in the construction, the poles and lines may introduce a color that contracts with the surround vegetation.

The location and alignment of the overhead electric lines has not been determined. However, direct routes, or often the shortest route from the water-disposal well facility to the existing power lines, may contribute to higher visual impacts. Care should be taken during the design of the alignment to assure that

the lines follow existing landforms and blend to the extent possible. Clearing of the power line right of way should be discouraged, and vegetation should only be pruned where necessary and not removed.

**Short-term Impacts:** Visual impacts from construction, drilling, and completion activities would occur with the proposed new well pad sites, access roads, and pipelines. The existing landscape would be changed by the introduction of new elements of form, line, color, and texture. The new pad, access road, and surface facilities would increase the presence of drilling rigs, heavy equipment, and vehicular traffic, with an associated increase in dust, light pollution from safety lighting on drilling rigs, and potential well flaring.

The construction of the access road and pad would require major earth work and vegetation removal in the immediate foreground. The exposed soils and augmentation of the landform would result in a strong contrast with the existing forms, lines, and colors of natural landforms. The removal of vegetation would also result in a strong contrast of form, line, color, and also texture between the existing and absent native plant material. The introduction of above-ground equipment such as tanks would also create a strong contrast with the form, line, and texture as there are currently no other structures of this magnitude in the landscape. Construction mitigation would occur, but it will be essential to plan the mitigation correctly to assure that it can meet the Class II requirements for short-term impacts.

**Long-term Impacts:** Long term impacts would likely occur from removal of vegetation, specifically trees and shrubs, especially with respect to linear disturbances from roads and pipelines. In this environment, trees and shrubs may not regenerate quickly, therefore leaving a long-term impact with a visible clearing of vegetation that contrasts with the surrounding landscape and would likely not meet VRM Class II objectives. In addition, light pollution may be an issue at sites which operate 24 hours a day and require safety lighting.

**Mitigation:** Adherence to applicable BMPs as described in Appendix C would minimize impacts to visual resources. In order to determine if the proposed activities will meet VRM Class II requirements it is essential to be able to analyze the details of a plan. The APD shall include a detailed, site-specific description outlining how the Proposed Action will be mitigated to meet VRM Class II objectives. The specific location of the facilities, including pads, roads, and pipelines, shall be shown on a map and contain associated cut-and-fill data (location, horizontal and vertical extent, slope length, and steepness) to be able to determine how much slope will be visible, where it would be visible, and if it will be seen from KOPs. A viewshed analysis from project-specific KOPs to determine the correct placement of the pad and facilities to determine if the proposed development can be mitigated to meet the requirement of Class II may also be required. This detailed, site-specific plan may require the addition of COAs in addition to those described in Appendix C, including the following:

- To reduce visual impacts to individuals utilizing the surrounding lands, low-profile tanks will be used.
- Production facilities shall be placed to avoid or minimize visibility from travel corridors, residential areas, and other sensitive observation points—unless directed otherwise by the authorized officer due to other resource concerns—and shall be placed to maximize reshaping of cut-and-fill slopes and interim reclamation of the pad.

**Cumulative Impacts** – Some of the proposed facilities would be built on fee/fee and may not be mitigated for visual impacts which will alter the viewscape of the area. The casual observer typically does not identify surface ownership when observing the landscape and the proposed facilities would likely be noticeable.

The existing environment would likely be altered due to the continuation of existing federal authorizations of ongoing operations of existing wells, as well as the likely development, operation, and maintenance of 11 new gas pads plus associated facilities and infrastructure. The existing visual resources in the area are expected to be altered through the likely development of approved facilities which includes

16 miles of road upgrades, 3 miles of new road construction, 17 miles of new pipelines, four flowback pits, compressors, and above-ground appurtenances.

The additional proposed development of the Proposed Action in combination with the likely development of the No Action Alternative, including the associated access roads, pipelines, and other facilities, as well as the pads, would introduce new forms, lines, colors, and textures not currently native in the landscape. The existing viewshed would begin to have more and more contrast between the existing natural landscape and the introduced man-made features as construction of new facilities takes place, leading to an overall viewscape that many not meet the criteria of VRM Class II.

**Alternative 1** – The types of visual impacts resulting from Alternative 1 would be similar to those from the Proposed Action.

Well Pad Sites: Within the SH 133 viewshed, a total of two well pad sites would have visible surface disturbance and above-ground facilities, and seven additional well pad sites with visible above-ground facilities. All nine of the well pad sites with visible disturbance would be on fee surface/federal minerals. The two well pad sites with visible surface disturbance represent approximately 7 acres of construction disturbance (using an average of 3.5 acres per well pad) and 2.76 acres of production disturbance (using an average of 1.38 acres per well pad). Compared to the Proposed Action, this is a reduction of 7 acres of construction disturbance and 2.76 acres of production disturbance.

Outside of the SH 133 viewshed there would be additional well pad sites visible from existing roads, notably CR 265. Of the remaining well pad sites, 32 of these proposed well pads are on fee/federal, with one site straddling fee/fee and fee/federal, and one pad on federal/federal. Some of the well pad sites may not be visible due to their placement within the landscape that would use the natural lines of the topography and vegetation to screen visual impacts. Additionally, other sites would only have visible facilities, which are easier to mitigate through proper placement and color treatment. In order to accurately analyze and quantify impacts, site-specific plans need to be provided detailing the location of the pad a facilities as well as the amount of cut-and-fill.

Linear Disturbance (Access Roads and Pipelines): The types of potential impacts from Alternative 1 would be similar to impacts from the Proposed Action.

The following are the estimated miles of linear disturbance within the SH 133 viewshed:

- Improved existing two track      1.0 mile
- New road      1.0 mile
- Pipeline co-located with roads      0.4 mile
- New pipeline      1.6 miles

The total disturbance would be approximately 4.0 miles of visible disturbance due to linear facilities, some of which may be able to be mitigated through proper design and placement. This is a reduction of 1.4 miles of linear disturbance as compared to the Proposed Action. Specific plans would need to be provided for each alignment in order to properly analyze if they will meet the Class II requirements.

Outside of the SH 133 viewshed there will be additional impacts from linear alignments, although some of the disturbance may not be visible due to their placement within the landscape that will use the natural lines of the topography and vegetation to screen visual impacts.

Short-term and long-term impacts for overhead electrical lines, construction, drilling, and completion activities would be similar to impacts from the Proposed Action. Mitigation measures would be the same as for the Proposed Action.

**Cumulative Impacts** – The types of cumulative impacts to visual resources from the implementation of Alternative 1 in combination with the No Action Alternative would be the same as for the Proposed Action. However, Alternative 1 would have 1.4 fewer miles of linear disturbance from roads

and pipelines than the Proposed Action, with proportionately less visual impacts during construction and production.

**No Action Alternative** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would develop up to 55 new wells on 11 well pads on fee surface and would add up to 11 wells to existing well pads. Direct and indirect impacts from noise would be increased for 2 groups of dwellings as compared to the Proposed Action. The existing visual resources in the area are expected to be altered through the likely development of approved facilities which includes additional wells on existing pads, 11 new well pads, 16 miles of road upgrades, 3 miles of new road construction, 17 miles of new pipelines, four flowback pits, and above-ground appurtenances.

## GEOLOGY AND MINERALS

**Affected Environment:** The Bull Mountain Unit is located on the eastern edge of the Colorado Plateau physiographic province and adjacent to the western edge of the southern Rocky Mountain physiographic province (Appel and Butler, 1991). There are numerous Quaternary surficial deposits including alluvium, colluvium, glacial deposits, and landslide deposits. Most of the area is underlain by the Wasatch formation which consists of claystone, siltstone, and sandstone with some conglomerate layers at the base near the contact with the Ohio Creek formation of the upper Mesaverde Group. The Wasatch formation tends to break down into a clay loam soil that can become unstable when saturated due to the high clay content.

The Ohio Creek formation consists of sandstone, siltstone, and shale and is found in the southeast part of the Unit along the valley walls and bottoms of East Muddy Creek. It forms steep canyons in areas of fluvial erosion and is known as a source area for rockfall hazards. Sandstone outcrops of the Ohio Creek Formation are visible along the valley of East Muddy Creek.

Potential geological hazards within the Unit include:

- Avalanches. A few limited areas within the Unit have slopes steeper than 30 degrees, generally considered the minimum angle for avalanche initiation in Colorado's snow climate. Avalanches may occur during periods of intensive snowfall (greater than one inch of snow per hour for 12 hours or more); however the area has not historically had significant avalanche hazards.
- Landslides. Existing landslide areas within the Unit comprise 1,163.4 acres, primarily on the east side of SH 133 in the southeast corner of the Unit (Figure 12). An existing landslide area near Spring Creek was active in 1986, during a period of above-average precipitation and rapid snowmelt (Appel and Butler, 1991). Evidence of recent landslide movement was found along the proposed pipeline route leading from SH 133 to the proposed FED 12-89-9 #1, with scarps ranging from 2 to 5 feet high (Trautner, 2011).
- Rockfall. Most rockfall hazards within the Unit occur along the west side of the SH 133 corridor. CDOT has conducted extensive mitigation in the form of rockfall fences and scaling of existing hazards. Some small areas occur near the top of slopes with slopes greater than 30%. One such area, which has a small outcrop of sandstone, is located north of the proposed access road and pipeline to the proposed FED 11-80-35 #1.
- Mudflows and debris fans. Mud or debris flows occur when soils become saturated, usually during an intense rain event, and begin to flow down-slope, often carrying rocks or boulders and building up sediment channels. A debris fan is created when the mud or debris flow spreads into a fan-like shape at the bottom of a gully. The landslides that occurred on the east and west sides of East Muddy Creek were a combination of rotation landslides and debris flows.

- Seismic activity. The State of Colorado/USGS database shows one minor earthquake recorded in the area of the Bull Mountain Unit in 1988, which does not correspond to any known landslide events.

Mineral extraction within the Unit is currently limited to existing CBNG wells developed by SG (see Table 3). A Plan of Development for the Hotchkiss Federal wells (including 16 wells on 15 well pads) was approved by the BLM on February 10, 2009. The project is located on BLM and fee land directly south of the Bull Mountain Unit between SH 133 and the National Forest System (NFS) boundary to the west approximately one mile north of the Paonia Reservoir. Four gas wells are currently in production, one water-disposal well is active, and two locations have been abandoned (COGCC database, 2011).



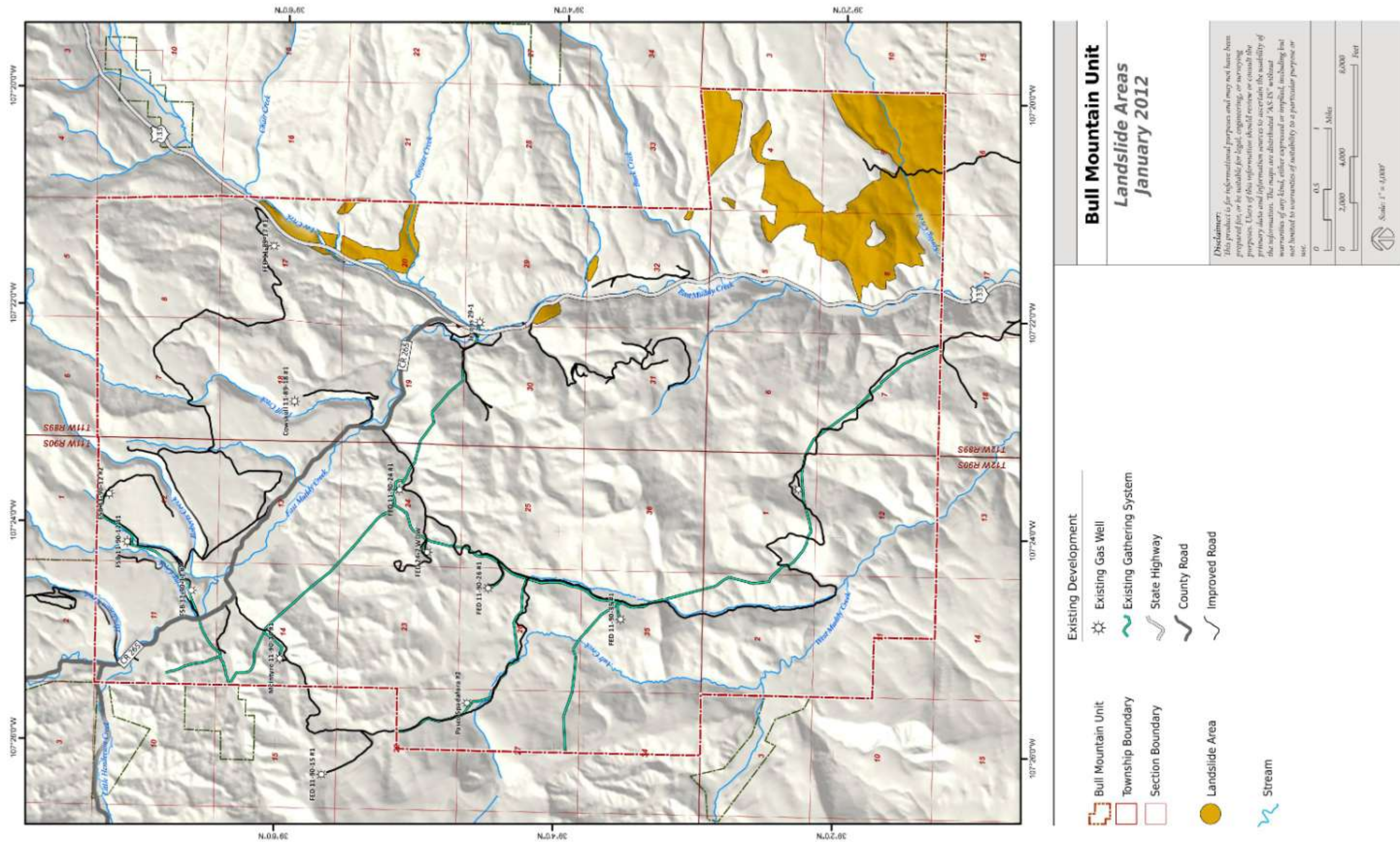


Figure 12. Landslide Areas in the Bull Mountain Unit



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## **Environmental Consequences/Mitigation:**

**Proposed Action** – Production of natural gas from CBNG and shale gas wells would contribute to the draining of hydrocarbon-bearing reservoirs from within the Mesaverde and Mancos Group, which complies with the BLM’s objectives for Management Unit 16. Production rates for natural gas from CBNG and shale gas wells would be highest during the first few years and then steadily decline over the life of the project. The Proposed Action is estimated to drain 785 billion cubic feet (bcf) of natural gas through 2051 based on a downhole drainage area of approximately 14,266 acres.

At full build-out, development of the water-disposal wells would result in the injection of an estimated 5,000–25,000 bbls of treated produced water from the CBNG wells (1,000–5,000 bbls/well/day) into the Dakota, Morrison, Entrada, and Maroon Formation’s sandstone members, at depths of approximately 8,600 to 9,500 feet. The proposed water-disposal wells would be Class II disposal wells as designated by the Environmental Protection Agency (EPA) for the purpose of injecting brines and other fluids associated with the production of natural gas. Class II wells protect fresh water resources by injecting waste fluid underground and preventing its disposal near surface water.

Class II wells are regulated by the COGCC as approved by the EPA under section 1425 of the SDWA noticed in the Federal Records on April 2, 1984. The COGCC administers the requirements for the Underground Injection Control (UIC) program. The State requires installation of continuous recording devices to monitor injection pressure, flow rate, volume, and the pressure on the annulus between the tubing and the long string of casing. This data is reported monthly to the COGCC. The COGCC also requires frequent analysis of injected fluids, periodic mechanical integrity tests (MIT) for the purpose of monitoring well and injection parameters, and other tests and measurements as required by the Regional Director for UIC. The COGCC would periodically inspect the disposal well site for regulation and injection pressure compliance. At present, three produced-water disposal wells are operating in Gunnison County including SG’s Federal 24-2 WDW, and three in surrounding counties (two in Chaffee County and one in Delta County). Currently 579 water-disposal wells are operating in Colorado (COGCC 2011), and there have been no reported problems or impacts to the underlying geology.

A total of 8.5 miles of existing roads, 1.86 miles of new access roads, and 1.32 miles of new pipelines would be located within the landslide area to the east of SH 133. Existing road segments in this area would be upgraded to accommodate increased traffic and mitigate potential hazards. Potential short-term and long-term direct and indirect impacts to installed surface and subsurface facilities could occur as a result of inherent geologic hazards in limited areas within the Unit including landslides, mud and debris flows, and rockfall. Adherence to applicable BMPs as listed in Appendix C would minimize impacts to geological and mineral resources. Extra caution would be advised when potential avalanche conditions exist, but no other mitigation is recommended. BLM may attach additional site-specific COAs to the APDs.

**Cumulative Impacts** – The cumulative impacts assessment area for geology and minerals is considered to be the Bull Mountain Unit and vicinity. Cumulative impacts would occur from the reasonably foreseeable implementation of the No Action Alternative in combination with either the Proposed Action or Alternative 1, as well as other reasonably foreseeable energy development in the vicinity. Long-term direct cumulative impacts would include drainage of the overall hydrocarbon resource in the Mesaverde formation, and reinjection of produced water, summarized in Table 50.

**Table 50. Comparison of Cumulative Geologic Impacts by Alternative<sup>1</sup>**

	<b>Proposed Action</b>	<b>Alternative 1</b>	<b>No Action</b>
Total length of roads in potential landslide area	1.4 miles	2 miles	0
Total length of pipelines in potential landslide area	1.3 miles	1.8 miles (0.4 miles co-located with road)	0
Total natural gas produced	785 bcf	438 bcf	374.1 bcf
Downhole acreage drained	14,266 acres	12,870 acres	6,491 acres
Reinjected produced water	6,000-30,000 bbls/day	6,000-30,000 bbls/day	1,000-5,000 bbls/day

<sup>1</sup> Estimated totals for all development by SG within the Unit based on 5-year project build-out and average 40-year life per well  
Source: SG Interests

Indirect cumulative impacts would include a potential reduction in the amount of natural gas available for drainage from wells in the immediate vicinity of the Unit.

**Alternative 1** – Alternative 1 is projected to drain 438 bcf of natural gas through 2051 based on a downhole drainage area of approximately 12,870 acres, or approximately 77% of the amount projected under the Proposed Action due to the more clustered configuration of the well sites. Potential impacts to installed surface and subsurface facilities would be similar to the Proposed Action, as would the amount of produced water to be reinjected. A total of 8.5 miles of existing roads, 1.83 miles of new access roads, and 0.9 miles of new pipelines would be located within the landslide area to the east of SH 133, somewhat reducing potential impacts to these facilities as compared to the Proposed Action. Adherence to applicable BMPs as listed in Appendix C would minimize impacts to geological and mineral resources. Extra caution would be advised when potential avalanche conditions exist, but no other mitigation is recommended. BLM may attach additional site-specific COAs to the APDs.

**Cumulative Impacts** – The types of cumulative impacts to geology and minerals from the implementation of Alternative 1 in combination with the No Action Alternative would be the same as for the Proposed Action.

**No Action Alternative** – Under the No Action Alternative, authorization of new development targeting federal minerals would be denied. SG would develop up to 55 new wells on 11 well pads on fee surface and would add up to 11 wells to existing well pads. The No Action Alternative is projected to drain approximately 374 bcf of natural gas through 2051 based on a downhole drainage area of approximately 6,491 acres, or about 42% of the amount projected under the Proposed Action due to the reduced number of wells and their placement within the Unit. The existing Federal 24-2 WDW would be the sole water-disposal well, injecting 1,000–5,000 bbls of treated produced water per day. Potential impacts to installed surface and subsurface facilities as a result of geologic hazards would be similar to the Proposed Action; however, the severity of these impacts would be greatly reduced because only one well, the proposed Volk 12-89-9 #2, and its associated access road and pipeline would be located within the landslide hazard area in the southeast portion of the Unit. A total of 0.14 miles of new access road, co-located with pipeline, would be required for this well.

## **SOCIO-ECONOMICS**

**Affected Environment:** The geographic analysis area considered for potential socioeconomic effects includes Gunnison and Delta Counties in Colorado. Some population, economic, and housing statistics are reported months or years after the period considered. As a result, some of the following information does not reflect the recent economic downturn and its effects on the areas surrounding the Bull Mountain Unit.

Population and Economic Conditions – Gunnison County’s population was 15,350 in 2009, representing a 10.0% increase from 2000, compared to statewide Colorado population growth of 16.8% during the same period. Delta County’s population was 31,322 in 2009, with a 12.5% increase since 2000 (USCB 2009a). Gunnison County includes a 6.6% Hispanic or Latino population, and an additional 2.8% minority population comprised primarily of Native Americans, African Americans and Asians (USCB 2009b). Delta County is comprised of a 13.8% Hispanic or Latino population, and an additional 2.1% minority population comprised primarily of Native Americans, African Americans and Asians (USCB 2009a).

Gunnison County’s economy is based on tourism and recreation, construction, agriculture, and natural resource production. Delta County’s economy is similar to Gunnison County’s, but also features a significant healthcare and nursing home industry. Based on the recent economic downturn, construction jobs have likely decreased in the past several years in both Gunnison and Delta Counties, though no supporting data is available.

A significant portion of the tourism in Gunnison County is based in the towns of Gunnison and Crested Butte; the Bull Mountain area’s economic conditions are not really comparable to the rest of Gunnison County. Specifically, agriculture and natural resource development are more dominant in the Bull Mountain area than tourism. Fall big game hunting is also a popular activity in this area.

Gunnison County’s labor force totaled 8,784 people in June 2010 (USBLS 2010), and it has remained the same since 2004 despite population increases during the past decade (USA CED 2010b). Gunnison County’s unemployment rate has increased, as a result of the economic downturn, from 4.2% to 7.3% in June 2010. However, the County’s unemployment rate remained lower than Colorado’s June 2010 unemployment rate of 8.3% (USBLS 2010). Average annual wages were \$25,326 in 2000, with a median household income of \$36,916. Gunnison County’s poverty rate was 15.0% in 2000 (USA CED 2010b).

Delta County’s labor force increased 12% from 14,290 people in 2004 (USA CED 2009a) to 17,298 people in 2009 (USBLS 2010). The unemployment rate in Delta County increased from 5.5% (USA CED 2009a) to 8.1% in June 2010 (USBLS 2010), which was similar to Colorado’s unemployment rate of 8.3% during the same period. In 2000, average Delta County wages were \$23,083 with a median household income of \$32,785, and a poverty rate of 12.1% (USA 2009a).

In the past ten years, oil and gas development has increased steadily in Gunnison County. In 2000, gas production for all of Gunnison County was 120,791 million cubic feet (mmcf), with sales of 118,803 mmcf. In 2009, gas production was 1,307,912 mmcf, with sales of 1,178,928 mmcf (COGIS 2010). SG alone has developed 11 wells (ten natural gas and one water disposal) in the area since 2005.

Housing Resources – The US Census Bureau reported 11,006 housing units in Gunnison County in 2000 (USA CED 2009b). In 2000, Gunnison County home ownership was 58.3% with a median housing unit value of \$189,400 (USCB 2009b). Of 3,486 vacant Gunnison County housing units in 2000, 114 were for rent (USA CED 2010b).

Delta County contained 12,374 housing units in 2000 (USA CED 2009a), with a home ownership rate of 77.5% and a median housing unit value of \$115,500 (USCB 2009a). A total of 1,316 Delta County housing units were vacant in 2000, and 200 of the vacant units were available for rent (USA CED 2010a). Due to the recent economic downturn, it is very likely that more housing units are currently available for rent in both Gunnison and Delta Counties than were available in 2000.

Quality of Life – The Bull Mountain area is rural and largely undeveloped, though some natural gas development is already present. SH 133, a scenic byway, also runs through the eastern portion of the unit. The area features cattle ranching and recreational activities, including fishing, hunting, and off-highway vehicle (OHV) use. Several areas proximate to the Unit, including the Ragged Mountain area and the Raggeds Wilderness Area, also provide hiking opportunities.

Law Enforcement and Emergency Response – Law enforcement services in the Bull Mountain area are provided by the Gunnison County Sheriff’s Office. Sheriff’s deputies provide routine patrol services, First Responder medical care and 24-hour on-call coverage for the area. The Sheriff’s office provides dispatch services for all emergency service agencies in the county. Emergency management is also provided under the jurisdiction of the Sheriff’s office through the County’s emergency manager. Ambulance service is provided by the Gunnison Valley Hospital in Gunnison. Delta County Hospital in Delta also offers ambulance service with advanced life support and is a certified Level IV trauma center. Montrose Memorial Hospital is a Level III trauma center. Fire-suppression services are provided by the Ragged Mountain Fire District.

Fiscal Conditions – Local and state government fiscal conditions examined for this assessment include property taxes, state severance tax and royalties. The Bull Mountain Unit is located within the Delta County School District, so applicable property and severance tax revenue would directly benefit the Delta County School District.

*Property Taxes* – Gunnison County’s total taxable assessed value for 2009 was \$860,656,930, with oil and gas property representing \$6,394,110 or .74% of total County assessed value (Gunnison County 2009a). Gunnison County reported \$6,903,396 in property tax revenue for 2009 (Gunnison County 2009b).

*Severance Taxes and Royalties* – Entities that own royalty interests on wells must pay a severance tax on gas or minerals removed from the ground (CO Dept of Revenue). Severance taxes in Colorado are 5% for natural gas, half of which goes to the Colorado Department of Natural Resources to fund water conservation, wildlife, and environmental programs. The Department of Local Affairs (DOLA) distributes 15% of the severance taxes (30% of the 50%) directly to local governments and 35% (70% of the 50%) to local government grant projects. The direct payments from DOLA to Colorado communities are often used to offset the impacts of drilling on roads, schools and public services.

Colorado local governments will receive \$37 million in state severance-tax revenue and federal mineral-lease payments (royalties) in 2010 (Denver Post 2010). Gunnison County received \$428,093 in severance taxes and \$988,302 in federal mineral lease distributions during 2010. In addition, the Delta County School District received \$126,527 in 2010 from severance taxes (DOLA 2010).

### **Environmental Consequences/Mitigation:**

**Proposed Action** – Implementation of the Proposed Action would result in draining 785 billion cubic feet (bcf) of natural gas through 2051 based on a downhole drainage area of approximately 14,266 acres. The economic, employment and fiscal effects would be greatest through project build-out, which would occur in approximately 2016. After construction and drilling is complete, there would be a marked reduction in employment opportunities and the need for materials. Only those employees operating and maintaining the Unit would continue to have consistent, year-round employment. Taxes and royalties would continue to benefit the communities as long as the Unit is producing. The lifetime expectancy of both coalbed and shale wells is generally 40 years; hence the Unit could continue producing until 2051.

Economic and Employment Effects – The Proposed Action would generate employment and local income throughout the construction and operation phases of the project, generally in Delta County. Natural resource development and construction would be the two industry sectors directly affected; other sectors—primarily the retail trade and service industries—would be indirectly affected.

Many employee and contractor needs would be met through hiring from the local workforce, including road and pad construction contractors, roustabouts, pumpers, pipeline station operators, and office staff. A portion of drilling rig operations and drilling consultant functions, along with part of the well completion, would also likely utilize local contract employees. Some specialty contractors and materials would likely be hired from outside the area due to the specific nature of their jobs. Non-local, seasonal employees would include four Houston-based employees that would reside in Colorado during the project.

Project initiation would require numerous local contractors on a seasonal basis from May to November for construction of roads, pads, and gathering pipeline. Contractor/consultant needs would be based upon construction schedules and would vary over the six years of Unit development. SG estimates the need for approximately 110 additional contract laborers for drilling and well completion during Unit development. Most of these positions would be eliminated upon completion of project build-out. SG also estimates that a total of 68 full-time, year-round employees would be necessary by 2016 to manage operations and maintenance of the fully developed Unit. These positions would remain constant for the duration of production and would include a variety of pumpers, pipeline station operators, and roustabout crew members.

Estimated annual payroll for construction, operation, and maintenance of the Unit under the Proposed Action would be at a high of \$11.3 million in 2016, and would decline to and remain steady at approximately \$3.4 million during production.

Development and operation of the Unit would also require goods and services from a variety of local and regional contractors and vendors, e.g., the purchase of materials, such as gravel available in Delta and Paonia, during road and pad construction. Expenditures by the proponent for these goods and services, coupled with employee and contractor spending, would generate positive indirect economic benefits in Gunnison and Delta Counties, as well as the surrounding area. Total annual material purchases for the Proposed Action are estimated at \$56,718,533 in 2012, increasing to \$52,368,140 by 2016, and declining to \$40,000 from 2020 through project build-out. Some products and materials would necessarily come from outside the area as well.

Population Effects – The Proposed Action would have no measurable impacts on the population of Gunnison or Delta counties. Heavy-equipment operators and a variety of other skilled laborers are readily available in the areas surrounding the Unit, and current unemployment rates have increased the availability of the local labor force. The local retail trade and service industries would indirectly benefit from increased employment resulting from project implementation.

Housing Demand – Housing availability in the areas around the Unit would be sufficient to accommodate employees needed to implement the Proposed Action. The small number of temporary specialty jobs could easily be absorbed through the existing housing supply in the surrounding areas.

Quality of Life – The Proposed Action would change the character of the Bull Mountain by directly increasing local jobs to boost the local economy and increasing local revenues in the service and retail sectors, primarily in Delta County. It would also increase property, severance, and royalty tax revenues for Gunnison County and the Delta County School District.

The Proposed Action may also have short-term and long-term adverse impacts on the Bull Mountain area. Continued natural gas development would increase traffic, dust, and noise in a traditionally quiet rural area. Access roads and wellheads would also change the landscape views during the life of the project. These impacts are more fully discussed in the Noise and Visual Resources sections.

Accelerated development of the area (in addition to natural gas development) may occur once access roads are established on private lands. Fishing, hunting, hiking, and OHV use may also decrease in the Bull Mountain and surrounding areas. Travelers on SH 133 would likely see pads and infrastructure, which may affect their experience (see the Visual Resources section for a detailed discussion); however, implementation of the Proposed Action is not anticipated to measurably impact the tourism industry. Many recreational activities and amenities are available throughout the area that would continue to draw tourists to the vicinity. There would likely be a reduction in hunting opportunities on private lands within the Unit as a result of construction, operation, and maintenance of the facilities within the Unit.

Increased natural gas development would likely impact cattle ranchers. Increased miles of roads and associated traffic as well as pads and pits would likely affect ranching operations to some extent, from the nuisance of additional gates to the possibility of animal mortality from vehicular collisions. Although

surface infrastructure would be fenced, it is assumed that these appurtenances would alter movement patterns, creating an additional effect on ranchers.

**Law Enforcement and Emergency Response** – Demand for law enforcement and emergency management services associated with construction and drilling operations could be accommodated without straining existing resources; the limited population growth associated with this project would not warrant additional law enforcement (Parmenter 2011). Additionally, SG would enforce rules and regulations associated with any “man camps” through the terms of their contracts.

**Fiscal Effects** – SG estimates net natural gas production for the Proposed Action at 784.8 bcf through 2051. Actual tax revenues would be dependent upon production, natural gas prices, and mills assessed on the product produced. Based on a natural gas price of \$5/1,000 cubic feet (mcf), the Proposed Action would generate an estimated \$530 million in royalties and \$378 million in property and severance taxes for a combined total of \$908 million through 2051.

No mitigation measures specific to socio-economics would be required.

**Cumulative Impacts** – The cumulative impacts assessment area for cumulative impacts to socio-economics is considered to be Delta and Gunnison Counties. Table 51 summarizes cumulative short-term and long-term direct economic impacts by alternative.

**Table 51. Comparison of Cumulative Economic Impacts by Alternative**

	<b>Proposed Action</b>	<b>Alternative 1</b>	<b>No Action</b>
<b>Build-out, 2012-2016<sup>1</sup></b>			
Annual labor force, drilling & completion	125	125	37
Annual labor force, full-time year-round employees	68	68	38
High annual payroll	\$14.2 million	\$14.2 million	\$ 6.4 million
Annual materials cost, startup	\$69.0 million	\$68.8 million	\$27.5 million
Annual materials cost, build-out	\$67.3 million	\$67.1 million	\$24.8 million
<b>Production, 2017-2051<sup>2</sup></b>			
Average annual labor force	75	75	38
Average annual payroll	\$ 4.1 million	\$ 4.1 million	\$ 2.4 million
Total natural gas produced	784.8 bcf	607.7 bcf	324.1 bcf
Total royalties <sup>3</sup>	\$567 million	\$499 million	\$234 million
Total property/severance taxes <sup>3</sup>	\$319 million	\$247 million	\$132 million
Total royalties, property & severance taxes paid <sup>3</sup>	\$886 million	\$746 million	\$364 million
Average annual materials cost	\$ 40 million	\$ 40 million	\$ 40 million

<sup>1</sup> Estimated totals for all new development by SG within the Unit based on 5-year project build-out

<sup>2</sup> Estimated totals for all existing and new development by SG within the Unit based on 40-year life per well.

<sup>3</sup> Based on a natural gas price of \$5/mcf

Source: SG Interests

Cumulative indirect impacts to quality of life as a result of the Proposed Action or Alternative 1, when added to likely development of the No Action Alternative and other reasonably foreseeable development of energy resources in Delta and Gunnison Counties, would include potential accelerated development of the area once access roads are established on private lands and diminished opportunities for and enjoyment of fishing, hunting, hiking, OHV use, and scenic tourism as a result of increased noise, traffic, and views of pads and infrastructure.



**Alternative 1** – Implementation of Alternative 1 would result in draining 438 bcf through 2051 based on a downhole drainage area of approximately 12,870 acres. Based on a natural gas price of \$5/mcf, Alternative 1 would generate an estimated \$296 million in royalties and \$211 million in property and severance taxes through 2051 for a combined total of \$507 million, or \$401 million less than the Proposed Action. Gunnison County government and the Delta County School District would experience an increase in tax and royalty revenues; however, the amount realized would be proportionately less than under the Proposed Action. Due to the more clustered pattern of development and reduced infrastructure, contractor/consultant needs would be reduced in duration from those levels needed to implement the Proposed Action. Due to the identical number of pads and wells, however, SG estimates the same number of additional contract laborers for drilling and well completion. Most of these positions would be eliminated when build-out is complete. Estimated annual payroll would be at a high of \$11.1 million in 2016, approximately \$200,000 less per year than the Proposed Action, and would decline to and remain steady at approximately \$3.4 million (the same as the Proposed Action) after full build-out. Gunnison County government and the Delta County School District would experience an increase in tax and royalty revenues; however, the amount realized would be less than under the Proposed Action. Total annual material purchases for Alternative 1 are estimated at \$56,469,908 in 2012, increasing to \$52,147,140 by 2016, and declining to \$40,000 from 2020 through project build-out. Other direct and indirect impacts to socio-economics would be virtually the same as the Proposed Action. No mitigation measures specific to socio-economics would be required.

**Cumulative Impacts** – The types of cumulative impacts to socio-economics from the implementation of Alternative 1 in combination with the No Action Alternative would be the same as for the Proposed Action.

**No Action** – Implementation of the No Action Alternative would result in draining 374.1 bcf of natural gas through 20451 based on a downhole drainage area of approximately 6,491 acres. Based on a natural gas price of \$5/mcf, the No Action Alternative would generate an estimated \$252 million in royalties and \$180 million in property and severance taxes through 2051, a combined total of \$432 million, or \$476 million less than the Proposed Action. Estimated payroll through build-out would be at a high of \$6.4 million in 2012, or about 57% of the high for the Proposed Action. Labor expenses would decline to and remain steady at approximately \$2.4 million after full build-out, about 71% of the total for the Proposed Action. Total annual material purchases for the Proposed Action are estimated at \$27,461,745 in 2012, increasing to \$24,787,830 by 2016, and declining to \$40,000 from 2020 through project build-out.

## CUMULATIVE IMPACTS SUMMARY

Per 40 CFR Section 1508.7, a cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Cumulative impacts for each element or resource are discussed within each of the sections above. Impacts resulting from the Proposed Action or Alternative 1 could add incrementally to impacts from other activities discussed below.

The geographic scope of analysis is generally based on the natural boundaries of the resources affected, rather than jurisdictional boundaries. The geographic scope often extends beyond the scope of direct effects for each resource but not beyond the scope of direct and indirect effects. If there are no direct or indirect effects of the Proposed Action or other alternatives on a particular resource, then no analysis is included for cumulative effects for that resource in this EA.

Timeframes, like geographic scope, can vary by resource. The proposed build-out of the Bull Mountain Unit is 6 years; however, the duration of the operation and maintenance of the unit could extend to 40 years or more, including final abandonment and reclamation. Some resources will be affected differently during construction than during operation of the wells. This is accounted for in the varying timeframes considered by resource.

The cumulative effects analysis for this project considers past, present, and reasonably foreseeable future actions that would affect resources of concern within the geographic scope and timeframe of the analysis. This analysis includes other BLM actions, other federal actions, and non-federal actions including state, local, and other private actions as identifiable.

### **Past and Present Actions**

Past actions are described by their aggregate effect rather than listing or analyzing the effects of individual past actions; however, more general types of actions that have occurred within the geographic extent of the analysis are included here. Present actions are those that are ongoing during the course of this analysis. These actions are also included below. The combination of these past and present actions creates the baseline for the analysis in the Bull Mountain MDP against which to compare the cumulative effects of the Proposed Action and other action alternatives.

The primary past and present disturbance within the cumulative impacts assessment area for the Proposed Action and Alternative 1 is associated with oil and gas leasing, mining, livestock grazing, and residential/agricultural development. Figure 12 shows the overall cumulative impact assessment area within an administrative boundary that includes past, present, and reasonably foreseeable future actions.

### **Federal (BLM and U.S. Forest Service)**

**Oil and Gas.** In the UFO, natural gas resources are located in the same general locations as coal resources, (north of SH 133, across from the Delta County towns of Hotchkiss, Paonia, and Bowie, in the Gunnison County town of Somerset, and in the area north of Paonia Reservoir) (BLM UFO Energy and Mineral Resources website [http://www.blm.gov/co/st/en/fo/ufo/solids\\_and\\_fluids.html](http://www.blm.gov/co/st/en/fo/ufo/solids_and_fluids.html) accessed 12-2-10, updated 10-28-11).

Approximately 418,469 acres federal oil and gas mineral estate are located within the cumulative impacts assessment area, and 173,646 are currently leased, including 54,580 acres of inventoried roadless area which were leased prior to implementation of the USFS Roadless Rule. If these pre-2001 leases expire and are subsequently leased again, they will have surface use restrictions for whatever roadless rule may be in place. Approximately 120,631 acres of federal oil and gas mineral estate remains available for nomination to be leased at this time. According to Colorado State historic records, 116 gas wells have been drilled in the North Fork area on federally managed oil and gas leases, including split estate lands. Of these wells, 15 are presently producing natural gas, 29 are shut-in but capable of production, and 72 have been drilled, abandoned, and plugged. The majority of these wells were drilled in the 1970s and 1980s. Most recent activity has related to re-drilling wells on existing well pads (BLM UFO Energy and Mineral Resources website). In the past few years, SG Interests and Gunnison Energy Corporation have begun to develop natural gas resources in the area. This includes construction of several new well pads and drilling approximately 15 wells in the area; it is mostly observed as the improvement of existing roads and construction of pipeline corridors. Figure 1 shows existing oil and gas leases within the Muddy Creek basin, including those associated with the Bull Mountain Unit.

SG currently operates and maintains 13 CBNG wells that are producing or capable of producing natural gas, and one water-disposal well. Three additional wells are in development. Produced water is being injected into deeper formations in the same vicinity, rather than using ponds or trucking to ponds located elsewhere (Table 3). The recently completed Bull Mountain Pipeline is approximately 25 miles long; the southern terminus is an existing facility that ties into SG's existing gathering system on private lands

northwest of the Unit. About five miles north of the southern terminus is the Ragged Mountain Pipeline Compressor site, which also provides some compression for the Bull Mountain Pipeline.

Currently 20 wells have been drilled on NFS lands in the Paonia Ranger District; the majority of these wells were drilled in the early 1980s, and many are shut-in. An approved Master Development Plan authorizes Gunnison Energy Corporation to drill 16 wells on four pads on NFS lands approximately 2-4 miles from the Bull Mountain Unit boundary (pers. com. Ryan Taylor, GMUG, Paonia RD, Geologist/Minerals Administrator, December 16, 2010).

Coal mining. The UFO manages several active federal coal leases related to three coal mines located in the valley of the North Fork of the Gunnison River near Paonia. Bowie No. 2, West Elk, and Elk Creek are actively producing longwall coal mines, with a total annual output approaching 12 million tons (BLM UFO Energy and Mineral Resources website as of September 30, 2011). These facilities are all downstream of the Bull Mountain Unit and do not affect resources within the Muddy Creek watershed.

The exception is air quality. All three of these operations require construction of roads and pads to facilitate the drilling of methane drainage wells (also known as gob vent bore holes) to pump additional gas out of the mines for the safety of the workers.

Historic mining activities over the past century include the following:

- Hawks Nest Mine
- Oliver Mine No. 1 and No. 2
- Bear Mine No. 1, No. 2, and No. 3
- Edwards Mine
- USS Steel Mine
- Blue Ribbon Mine
- King Mine
- Farmers Mine
- Oxbow Sanborn Creek
- Bowie No. 1 Mine

Grazing Allotments. The UFO manages 240 grazing allotments with 165 grazing permittees. Historically, several areas throughout the Unit sustained high levels of both sheep and cattle grazing. Seasonal cattle grazing still occurs, to a lesser degree, from approximately June through September. The Forest Service conducted an Environmental Assessment in 2005 for the Muddy Creek basin (also known as Muddy country). On NFS lands surrounding the unit, there are eleven allotments with multiple permittees managing approximately 12,480 ewe/lamb pairs, 1,048 cow/calf pairs, and 30 horses. These allotments are managed intensely with multi-pasture rotations of relatively short duration.

This resource is primarily affected by surface disturbance of forage habitat for the livestock. With the coal mines and increasing oil and gas development, there continues to be a loss of grass/forb vegetation communities, which have become a limiting factor for grazing. On the Forest, some shut-in wells had not been reclaimed, which continues to affect the amount of forage available to livestock (pers. com. Dave Bradford, GMUG National Forest, Paonia Ranger District, Range Management, December 16, 2010). Noxious weeds have become an increasing concern over the past few years with the growth in many activities, including gas exploration and development as well.

**State (CDOT)** – 2011 activities on SH 133 include snow maintenance and emergency response actions. CDOT is working on highway improvement projects on Highway 92 from Hotchkiss to Delta and Highway 50 in the Blue Mesa Lake area; both of these projects are likely to continue for the next several years (pers. comm. Pete Mertes, CDOT Region 3 Engineer, December 2, 2010).

**Local/Municipal (Gunnison and Delta Counties)** – Gunnison County's Assistant Director of Community Development Neil Starkebaum emphasized that lands in the Bull Mountain Unit area are designated almost exclusively agricultural and that the current land use is primarily ranching with interspersed residences. The area is nearly surrounded by NFS lands. There is a small mixed use area south and southeast of County Road 849; however, there are no commercial or industrial uses occurring

in this area. The East Bull Mountain subdivision is in the general area; it consists of six 35-acre lots of which only one has been developed. As detailed above, Gunnison Energy Corporation permitted 16 wells on nine pads (Hotchkiss Federal) through Gunnison County; several pads have been constructed, and several wells have been drilled to-date (pers. com. December 6, 2010).

Delta County Senior Planner Dave Rice indicated that with one exception, Gunnison Energy is the sole O&G operator in Delta County. Since 2005 they have drilled approximately ten wells and installed a gathering line in the Oak Mesa area, which is north of Hotchkiss and west of Paonia (pers. com. November 17, 2010).

Several gravel pits have also been approved in the past five years; however, most are within just a few miles of the city of Delta itself.

Residential developments in the area around the communities of Paonia, Hotchkiss, Crawford, and Delta have been growing in population, with many new houses being built. Most of this development has been down-valley from the coal mines in broader portions of the North Fork Valley. This development has increased the traffic load and demand for maintenance on State SH 133.

**Private** – On private lands within Delta and Gunnison Counties, COGIS records as of November 2011 show a total of 43 natural gas wells; 19 wells are producing, 16 are shut-in and capable of producing; 2 are waiting on completion; and the remaining 6 were drilled, abandoned, and plugged.

### **Reasonably Foreseeable Actions**

A reasonably foreseeable future action is more than speculation. In most cases, an action has gone through initial stages of planning and permitting and has an available source of funding. The first step in determining reasonably foreseeable future actions was to review the Schedule of Proposed Actions (SOPA) for both the BLM and USFS for the project area. The SOPA includes projects that have been formally accepted by the agency for analysis. The Colorado Department of Transportation was contacted regarding SH 133. Meetings were held with both the Delta County planning and Gunnison County community development departments to assess other reasonably foreseeable actions. The following list describes those actions within the geographic scope of the project that are reasonably foreseeable.

### **Federal**

Oil and Gas. Increased development in the cumulative impacts assessment area exceeds the past average. Changes in technology for the drilling and development of Mancos shale wells and wells used to capture methane from coal mines have made development economically feasible. It is estimated that the area will average 20 new wells per year (assuming at least 2 wells per pad and 10 new pads per year) and result in approximately 68 acres of new disturbance per year from oil and gas development.

According to COGIS, 3 drilling permits were issued in 2011 in Gunnison County (all to SG) (<http://cogcc.state.co.us/website> accessed in November 2011). Two drilling permits were issued to Gunnison Energy in Delta County. Pending oil and gas activity includes a total of 22 permits, as follows:

- 9 shale well permits;
- 8 coal-bed methane wells; and
- 5 coal mine methane wells.

Total estimated disturbance based on current permits would be approximately 150 acres (based on 6.8 acres of disturbance per well).

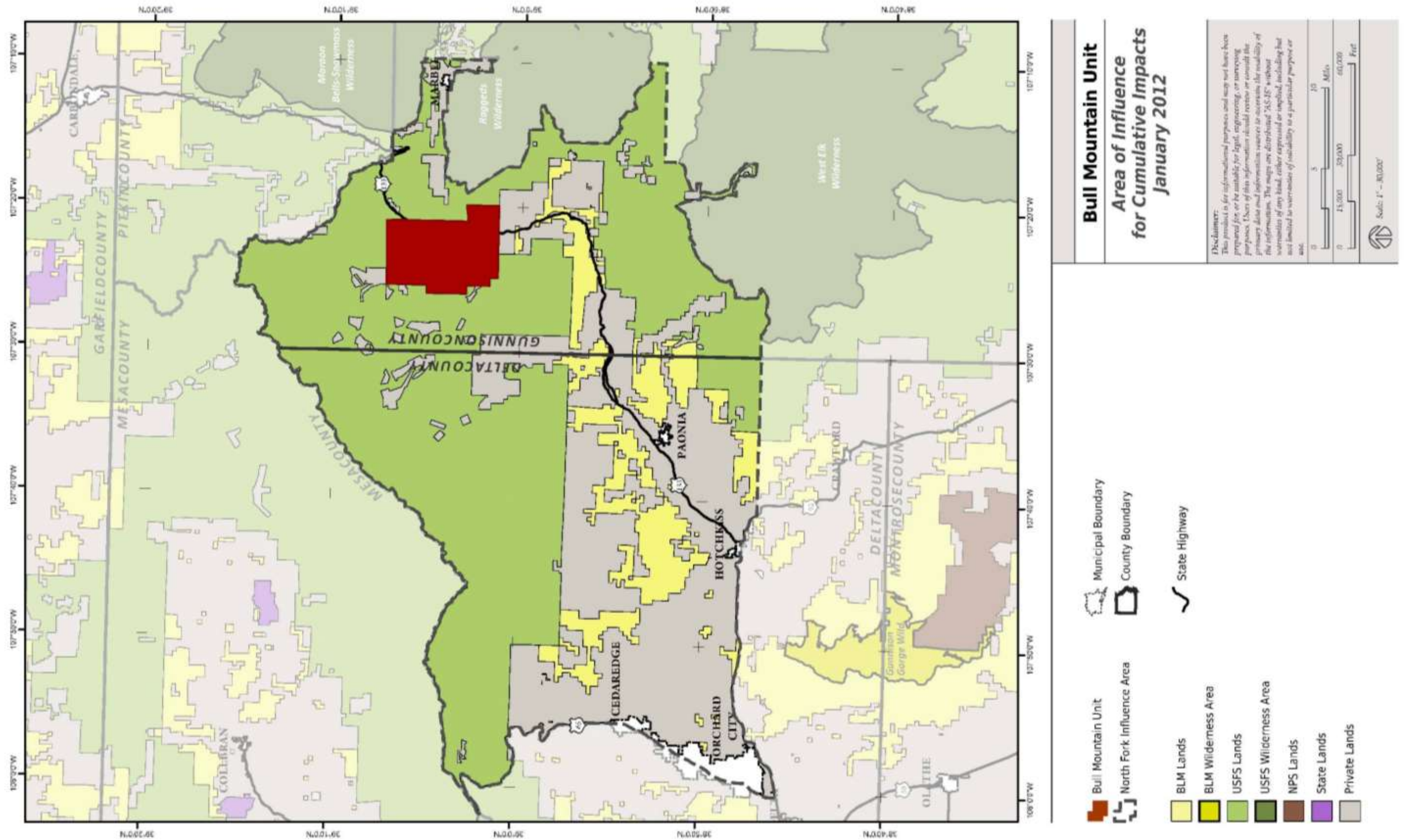


Figure 13. Cumulative Impact Assessment Area for the Bull Mountain Unit

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The BLM is currently developing an EA regarding the nomination to lease nearly 30,000 acres of federal oil and gas mineral estate to be include in the Colorado BLM August 2012 Quarterly Lease Sale. Approximately 22,000 acres of the proposed nominations lie within the cumulative impacts assessment area for the EA.

**Mining.** Coal mines in the region are likely to continue exploration drilling and will seek to increase their lease holdings in order to increase production. Two modification requests are being processed by the Forest Service and one by the BLM. Most are less than 160 acres; however, the West Elk mine is seeking an increase of 1,700 acres to its lease holdings. The BLM is also beginning to analyze a coal exploration license on Oak Mesa.

The Tomichi Creek Exploration Project on NFS lands in the Gunnison Ranger District filed a Plan of Operations in October 2011 to drill 9 exploration holes for molybdenum and copper on unpatented mining claims, all located on previously disturbed roads or travel routes.

**State** – CDOT currently has no plans in the short term (five years) or long term (15-20 years) for major construction or improvements on SH 133. The ongoing work on Highways 50 and 92 is anticipated to continue for the next several years (pers. com. Pete Mertes, CDOT, December 3, 2010).

**Local** – The 1996 Delta County Master Plan is the governing document for the county’s planning and development. Although it is in the process of being revised, the basic goals and objectives remain the same, and there is no expectation for changes to the plan (pers. com. Dave Rice, Delta County Senior Planner November 17, 2010).

The Town of Paonia has been working on an area just outside the town for a designated commercial growth area. The SH 133 Corridor Master Plan was crafted to address new development that is in close proximity to the municipal boundaries and that has a direct influence on future growth, economic vitality and Paonia's small town character. The SH 133 Overlay was approved by the Town Council as of October 2010. The plan was scheduled for appearance before the Board of County Commissioners in November; however, no further updates are available at this time.

**Private** – COGIS records indicate that no additional wells on private lands are in the approval process. SG has received permits for four flowback pits (referred to as the McIntyre pits 1-4), which would temporarily store water prior to and after hydraulic fracturing and completion operations and associated infrastructure. These pits would service many possible well drilling and hydraulic fracturing operations across the northern half of the Bull Mountain Unit. The pits will be located in close proximity to the FED 11-89-24-2 WDW, which was permitted and constructed in 2008.

Cumulatively, impacts from the proposed lease modifications could include small increases in deposition of sediment or pollutants into surface waters, increased subsidence within the North Fork Valley, low increase in cumulative emission of GHGs from mine ventilation, and a slight increase in water withdrawal from the Colorado River system that may potentially impact several federally-listed species of fish in downstream portions of the North Fork and Gunnison Rivers. None of these impacts is expected to be major as analyzed in the specific resource sections.

Impacts resulting from the proposed lease modifications could add incrementally to impacts from the other activities discussed above, resulting in a low-level increase in noise, human presence, soil erosion, invasive weeds, wildlife habitat loss, and vegetation loss or conversion. These impacts are discussed in the sections below. Cumulative impacts associated with coal mining activities in the area were analyzed in greater detail in the Uncompahgre Basin RMP Environmental Impact Statement (BLM, 1988).



## PERSONS / AGENCIES CONSULTED

The following federal, state, county, or Tribal entities were consulted during development of this EA:

- Colorado Parks and Wildlife, Paonia District Wildlife Manager and Oil and Gas Liaison – Southwest Region
- Gunnison County Road and Bridge Department
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- U.S. Forest Service, Paonia Ranger District

Preparation of the EA also included input from the following private parties or contractors:

**Table 52. List of Preparers**

<b>Name</b>	<b>Company</b>	<b>Area of Responsibility</b>
Linda Schuemaker	Otak, Inc.	Project Coordinator and Writer/Editor; Access and Transportation; Environmental Justice; Fire; Geology and Minerals; Noise; Realty Authorizations; Soils; Waste, Hazardous and Solid
John Berry	WWC Engineering	Hydrology and Water Rights; Water Quality, Surface and Ground
John Cater, PhD	Aztec Archaeological Consultants	Cultural Resources, Paleontology
Zach Perdue	PENDO Solutions	GIS, Mapping, Site Development
Eric Petterson	Rocky Mountain Ecological Services, Inc.	Special Status Species, Wildlife, Wetlands, Vegetation, Invasive Species, Rangeland Management
Lisa Sakata	PENDO Solutions	Socio-economics
Kate Schwarzler, LA	Otak, Inc.	Recreation, Visual Resources
Andrew Gleason, P.E.	Trautner Geotech, LLC	Geology
Jim Zapert	Carter Lake Consulting	Air Quality

**INTERDISCIPLINARY REVIEW:** The following BLM personnel have contributed to and have reviewed this environmental assessment.

**Table 53. Interdisciplinary Review Team**

<b>Name</b>	<b>Title</b>	<b>Area of Responsibility</b>
Thane Stranathan	Natural Resource Specialist	Oil and Gas, Planning and Enforcement
Amanda Clements	Ecologist	Wetlands & Riparian Zones
Rob Ernst	Geologist	Geology and Minerals
Edd Franz	Recreation Specialist	Wilderness, Wild and Scenic Rivers
Glade Hadden	Archaeologist	Cultural Resources; Native American Religious Concerns; Paleontology
Dan Huisjen	Natural Resource Specialist	Fire
Julie Jackson	Recreation Specialist	Access and Transportation, Recreation, Visual Resources
Allen Kraus	Environmental Protection Specialist	Wastes, Hazardous or Solid
Bruce Krickbaum	NEPA Coordinator	Environmental Justice, Socioeconomics
Lynae Rogers	Rangeland Management Specialist	Vegetation, Range Management, Invasive Species

**Table 53. Interdisciplinary Review Team**

<b>Name</b>	<b>Title</b>	<b>Area of Responsibility</b>
Jed Sondergard	Hydrologist	Farmlands (Prime and Unique), Floodplains, Hydrology, Soils, and Water Quality (Surface and Ground), Water Rights
Melissa Hovey	Air Quality Specialist	Air Quality
Teresa Pfifer	Supervisor, Lands and Minerals	Noise
Ted Moe	Law Enforcement Officer	Law Enforcement
Teresa Pfifer	Staff Supervisor	Land and Minerals
Linda Reed	Realty Specialist	Realty Authorizations
Melissa Siders	Wildlife Biologist	Migratory Birds; Threatened, Endangered, and Sensitive Species; Wildlife, Aquatic and Terrestrial

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